EXPORT ISSUE

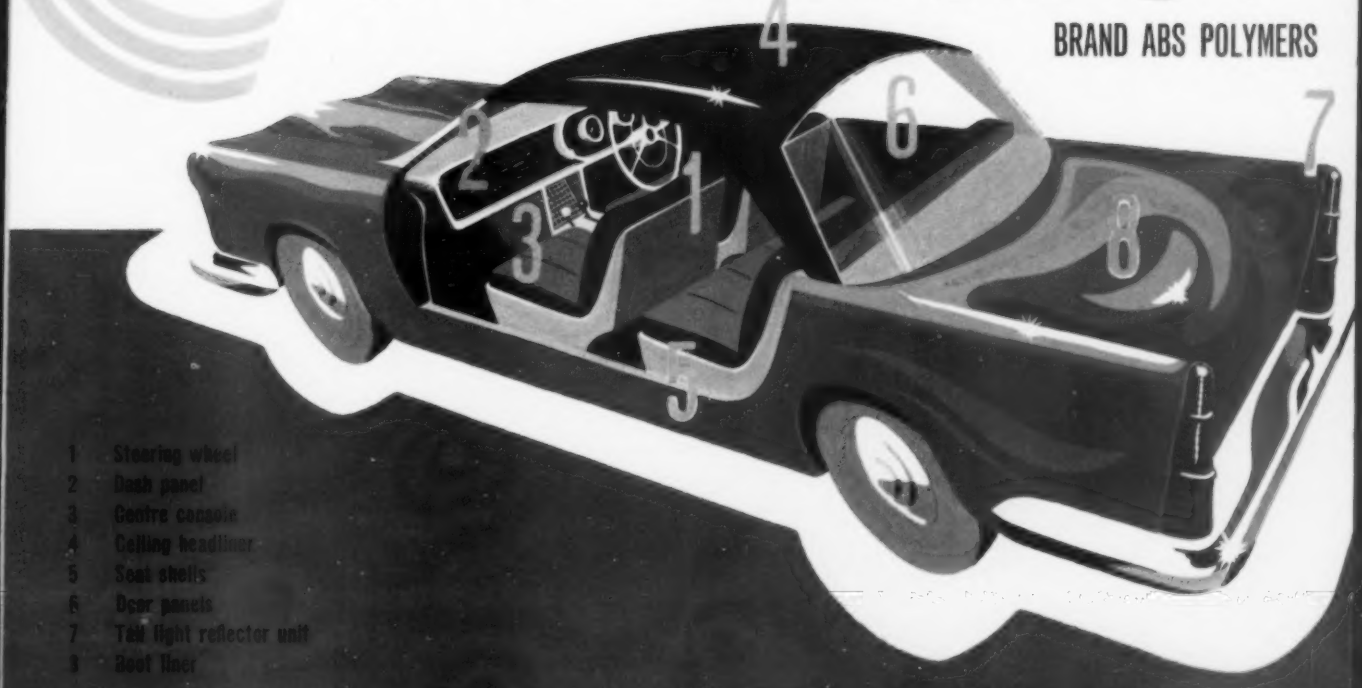
RUBBER and PLASTICS WEEKLY

VOLUME 141 NO. 17 OCTOBER 21 1961 ONE SHILLING

The strength of steel....the freedom of plastic!

CYCOLAC B

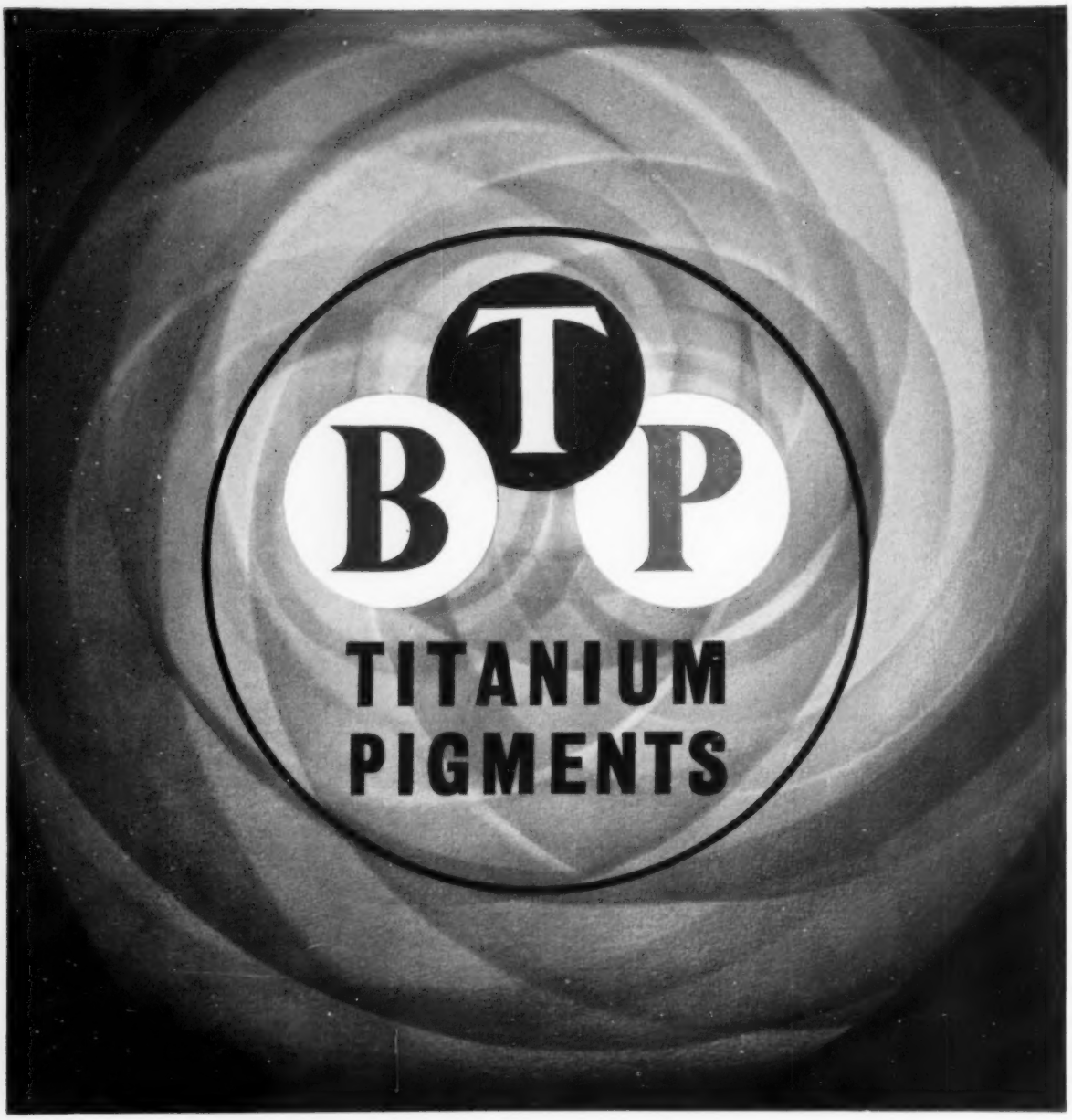
BRAND ABS POLYMERS



ANCHOR CHEMICAL COMPANY LTD—MANCHESTER 11

Offices in London, Glasgow and New York. Agents in all principal countries

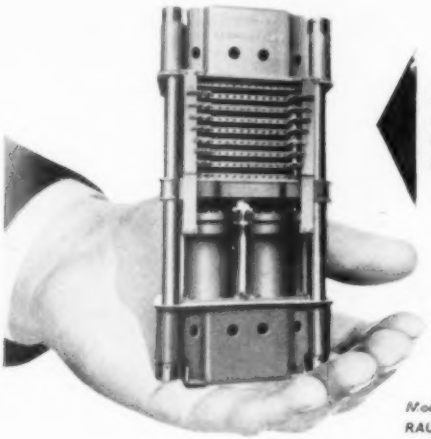
Distributors for
Marbon Chemical Division
of Borg-Warner Corporation
CYCOLAC is a registered trademark.



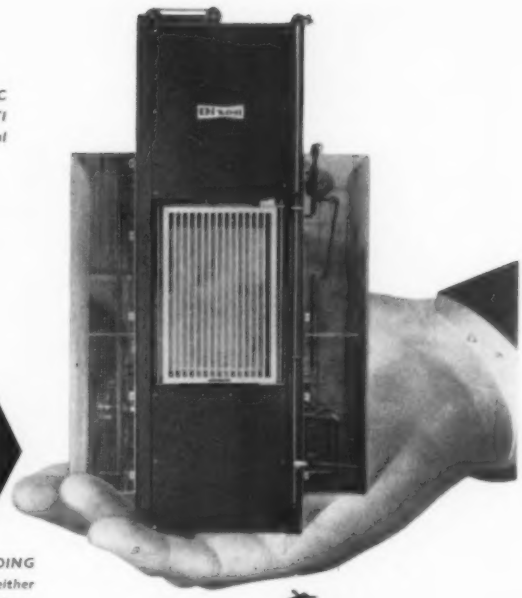
TIOXIDE
pigments
for
brilliant whites
and
beautiful tints

BRITISH TITAN PRODUCTS COMPANY LTD. is today the largest producer of titanium pigment in Europe. B.T.P. TIOXIDE pigments, with their supreme opacity, give extraordinary brightness to whites and pastel shades in rubber and plastics with minimum loading.

British Titan Products Co Ltd
10 STRATTON STREET LONDON W.1



Model 810. DIXON HYDRAULIC MOULDING PRESS, MULTI DAYLIGHT. Steam-heated, total pressure 500 tons.



Model 812. DIXON HYDRAULIC MOULDING PRESS, SINGLE or MULTI DAYLIGHT. Electrically or steam heated, total pressure 176 tons.

DIXON HYDRAULIC LOADING TABLES. For operation either from pump unit or main hydraulic line. Three standard models, but size of table and lift can be varied to suit specific requirements.

Model 415. DIXON RAPID SLUG CUTTER. Cuts up to 12,000 slugs per hour from extruded stock — up to 4" diameter.

on every hand

IN THE RUBBER & PLASTICS INDUSTRIES YOU FIND

MACHINERY by . . . Dixon

For complete data on the above and the full range of Dixon-built precision machinery please write or telephone:

T. H. DIXON & CO. LTD.

Letchworth, Herts, England. Tel: Letchworth 666

or from the Sole U.K. Agents for the Rubber Industry:

COLUMBIAN INTERNATIONAL (Great Britain) Limited

116 Cannon Street, London, E.C.4 Tel. MANsion House 5277 (P.B.E.)

RECLAIMED RUBBER

QUALITY UNIFORMITY

Manufacturers of

ALKALI - NEUTRAL - THERMAL

AQUEOUS DISPERSION RECLAIMS

SYNTHETIC RECLAIMS

VULCANISED BITUMEN

MIRTEX MINERAL RUBBERS

FIBRE STOCKS

NORTHWESTERN RUBBER CO., LTD.

LITHERLAND · LIVERPOOL · ENGLAND

Telephone: BOOTLE 5812/6

Telegrams: RUBRIC, LIVERPOOL, 21

Established 1901

WALLACE-SHAWBURY CUROMETER

The instrument which measures and records cure characteristics of rubber

Test takes no longer than vulcanising a small specimen.

Equivalent to 300% tensile modulus.

Measures scorch-time at any temperature up to 200°C.

Simple, inexpensive, easy to use, no electronics.

Saves hours of work and calculation.

WALLACE
of Croydon

Manufacturers of Test Equipment

H. W. WALLACE & CO. LTD., ST. JEROME'S RD., CROYDON, ENGLAND | TELEGRAMS: TESTING CROYDON

The most comprehensive range of testing equipment in the world

EXPORT REPRESENTATIVES

AUSTRALIA
Gollin & Co. Ltd.,
Melbourne.

AUSTRIA
Technisches Büro Dietrich & Co.,
Vienna.

BELGIUM
Compagnie Anversoise de Produits Chimiques, S.A.
Antwerp.

CANADA
Charles Churchill (Canada) Ltd.,
Toronto.

CHINA
J. H. Little & Co. Ltd.,
London.

DENMARK
Chr. Krogh,
Copenhagen.

EGYPT
Serko Kaisserhan,
Cairo.

FINLAND
A. B. Wilh. Bensow O.Y.,
Helsingfors.

FRANCE
Societe Francaise R. W. Greoff & Co.,
Paris.

GERMANY
Rasmus Gebrüder & Co.,
Hamburg.

GREECE
G. N. Kallivroussis,
Athens.

HOLLAND
N. V. Rotterdamsche Agentuur-en Handel-Maatschappij,
Rotterdam.

INDIA
A. Natarajan,
Calcutta

ISRAEL
Curt Israel,
Tel-Aviv.

ITALY
V. Antonio Leone & Co.,
Turin.

JAPAN
Heisen Yoko Co. Ltd.,
Tokyo.

MALAYA
Mechanical & Combustion Engineering Co. Ltd.,
Singapore.

NEW ZEALAND
Neill, Cropper & Co. Ltd.,
Auckland.

NORWAY
Paus & Paus A/S,
Oslo.

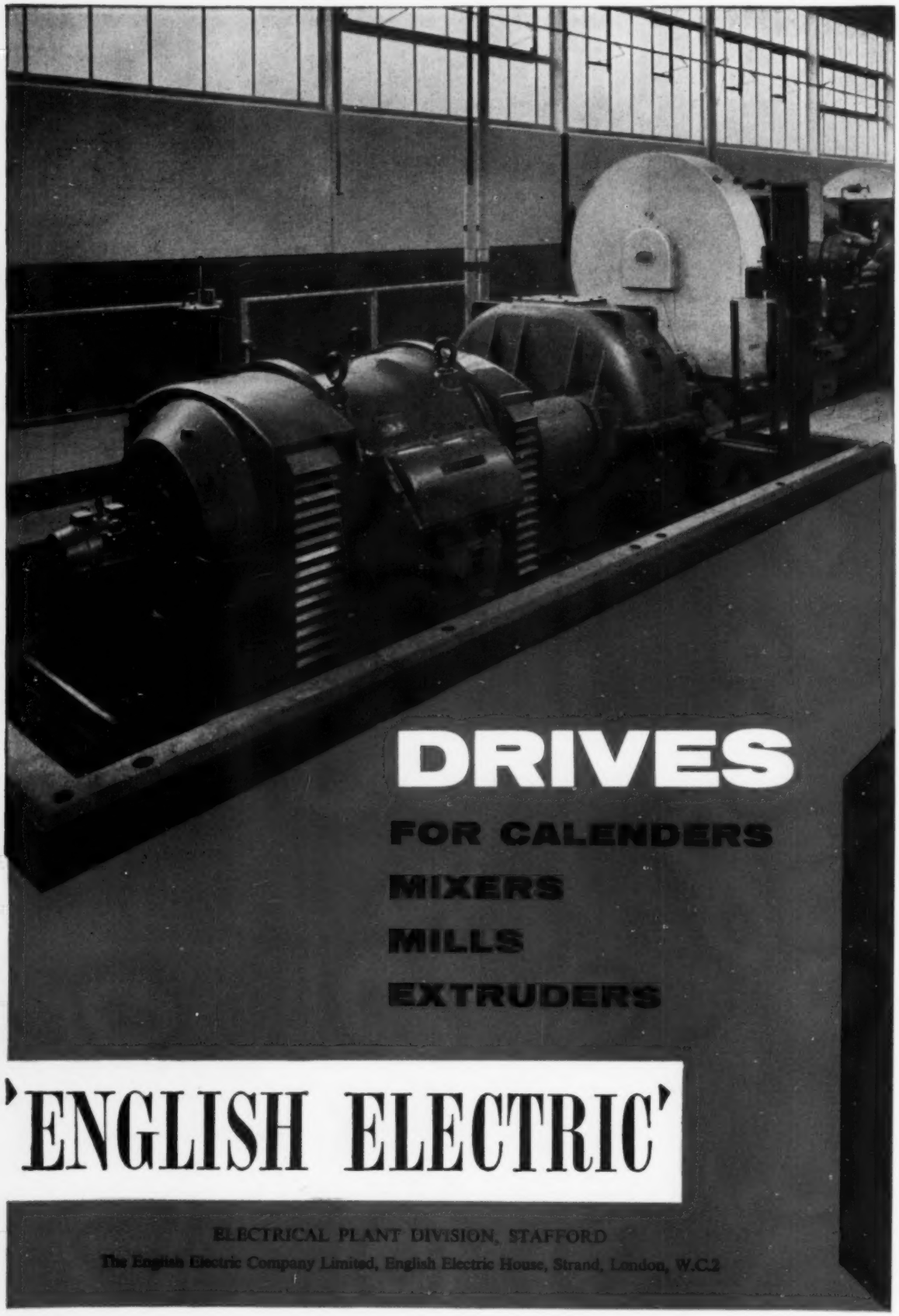
PORTUGAL
Socilda, Sociedade Comercial E Industrializ Adora LDA.
Lisbon.

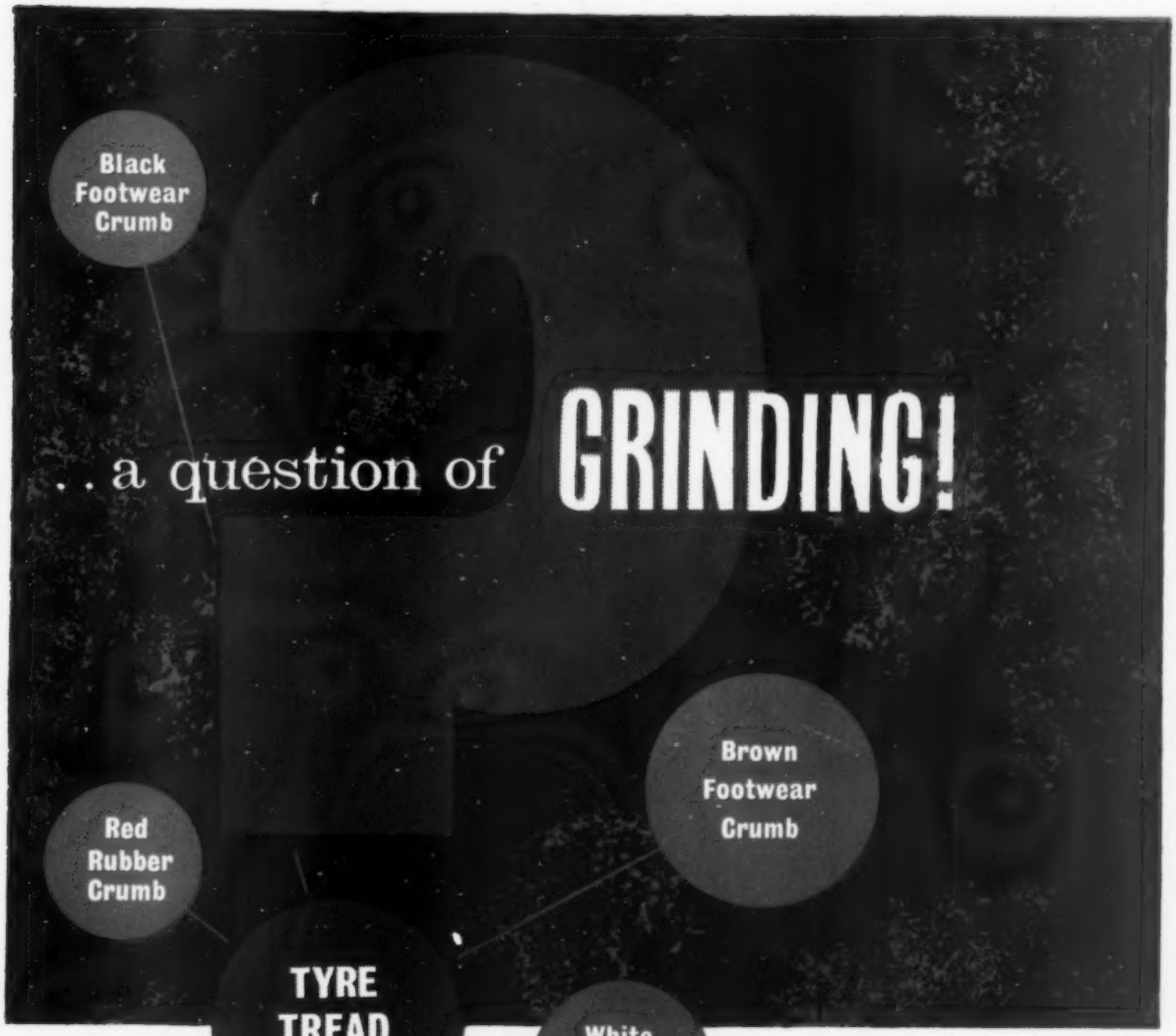
SOUTH AFRICA
G. J. Wevell (Pty.) Ltd.,
Johannesburg.

SPAIN
Masso y Carol, S.A.,
Barcelona.

SWEDEN
Rubber & Plastics AB,
Stockholm.

U.S.A.
Testing Machines, Inc.,
Mineola, N.Y.


DRIVES
FOR CALENDERS
MIXERS
MILLS
EXTRUDERS
'ENGLISH ELECTRIC'
ELECTRICAL PLANT DIVISION, STAFFORD
The English Electric Company Limited, English Electric House, Strand, London, W.C.2



STANDARD MESH SIZES :
18's 20's 24's 30's

. . . and the B.R.R. group have the answers. For over 80 years we have been solving problems of grinding for many well-known manufacturers whose products are household words. A wealth of knowledge and experience is therefore available to you. New laboratories with the very latest equipment back our technical service which is at your disposal.

All enquiries welcomed by :

ASSOCIATED COMPANIES
•
JOSEPH ANDERSON & SONS LTD.
•
IRKDALE INDUSTRIES LTD.

BRR

BRITISH RECOVERED RUBBER AND CHEMICAL COMPANY LIMITED

ASHTON NEW ROAD · CLAYTON · MANCHESTER 11

Telephone: EASt 3241/6 *Telegrams: 'Reclaimed' Manchester*

ROTUNDA

LIMITED · DENTON · MANCHESTER

Specialise in –

THE MANUFACTURE OF

ELECTRICAL INSULATING TAPES

BLACK ADHESIVE P.V.C. ELECTRICAL TAPE PITCH AND BITUMEN RUBBER SPLICING COMPOUND PURE RUBBER STRIP

FOOTWEAR MATERIALS

'CANKAF' REGD. THE SUPERIOR QUARTERLINING
'PARAMOUNT' REGD. QUALITY BACKING CLOTHS

SELF ADHESIVE CLOTH TAPES

FOR THE MOTOR AND ELECTRICAL INDUSTRIES FOR PACKAGING AND SEALING FOR CONFECTIONERY AND ALLIED TRADES ALSO WATERPROOF FOR TROPICAL PACKAGING

RUBBER BANDS IN ALL SIZES AND COLOURS

FOR EVERY PURPOSE

EXTRUDED TUBES, GRIPS AND ACCESSORIES

FOR PRAMS, TOYS, CYCLES, ETC.

ELECTRICAL CABLE MAKER'S MATERIALS

PROOFED AND PRINTED CLOTH, BITUMINISED CLOTH, HESSIAN AND PAPER, OILED CLOTH, RUBBER COMPOUNDS, ETC.

Regd.

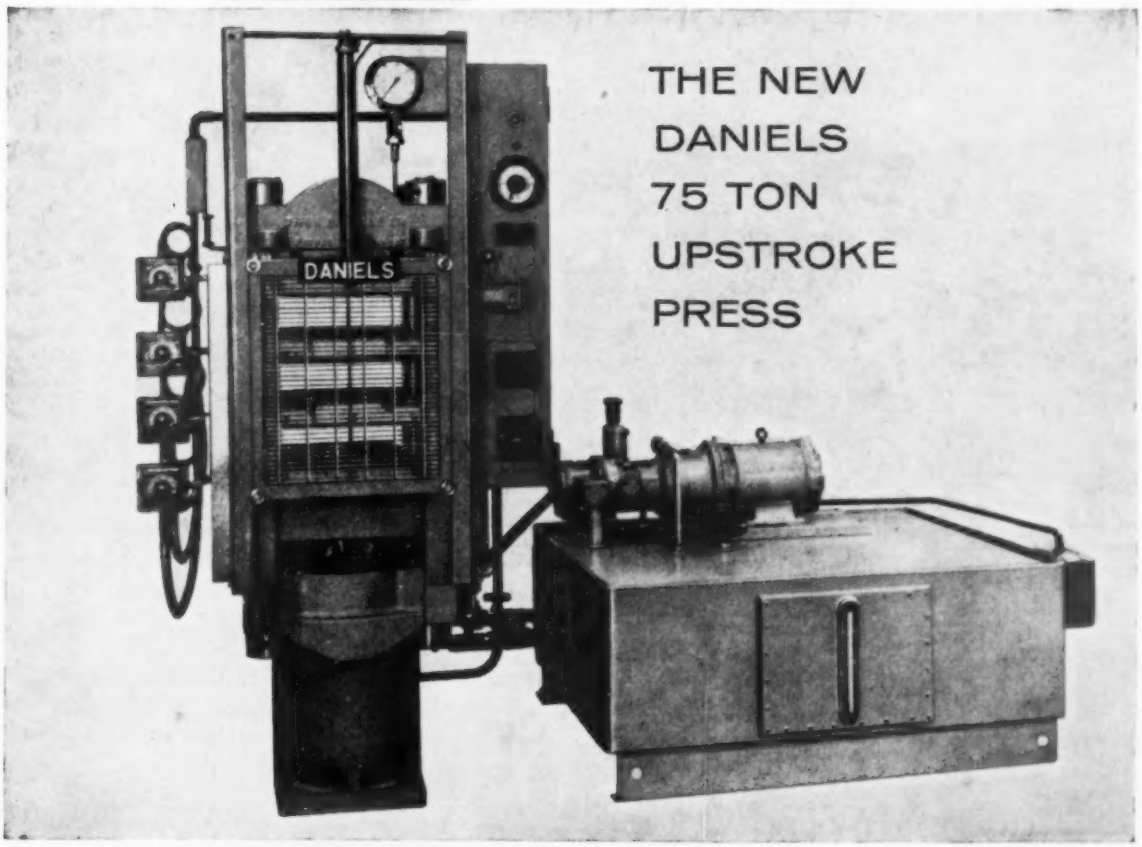
ROTUNDA

This latest Daniels press is one of a new range designed for the moulder who wants a faster and more efficient machine than is in general use today. Opening and closing time is three times faster than on most conventional machines—the press movement in each cycle taking only 8½ seconds to complete an opening AND closing stroke of 11".

The press illustrated has a built-in cure timer which makes semi-automatic operation possible; the operator is merely responsible for loading, unloading and initiating the cycle, all press and guard movements are then automatic.

FULL CYCLE IN 8½ SECONDS

This new fast-acting press has infinite pressure adjustment from 15 to 75 tons and on shorter moulding cycles it can give up to *five extra lifts during an eight hour shift*. Write for full details of this, and other presses in the new range.



DANIELS OF STROUD

T. H. & J. Daniels Limited · Stroud · Gloucestershire · England
Telephone: Stroud 661-664 · Cables: Daniels, Stroud
Telex: 43-43 Daniels · Stroud · England

present, however, we must confine ourselves to the exhibits of Messrs. Jennens and Bettridge, of Belgrave-square, and Birmingham. The easy chair thus appropriately named was designed by Mr. Fitz Cook, and manufactured in papier maché by the exhibitors. The chair is decorated at the top with two winged thoughts—the one with bird-like pinions, and crowned with roses, representing happy and joyous dreams; the other with leathern bat-like wings—unpleasant and troublesome ones. Behind is displayed Hope, under the figure of the rising sun. The twisted supports of the back are ornamented with the poppy, hearts-ease, convolvulus, and snow-drop, all emblematic of the subject. In front of the seat is a shell, containing the head of a cherub, and on either side of it pleasant and troubled dreams are represented by figures. At the side is seen a figure of Puck lying asleep in a labyrinth of foliage, and holding a branch of poppies in his hand.

The Day Dreamer is a most successful adaptation of this material to an altogether novel design. The same firm also exhibit the Victoria Regia papier maché Cot, designed by J. Bell, sculptor, wrought in gold and colours of emblematical devices. Also the Registered Pianoforte in papier maché (seven-octave cottage), the mechanism by Dimoline, of Bristol—the form and decoration in the Italian style. Papier maché music-stool and Canterbury, en suite.—The "Multum in Uno" papier maché tea table, combining chess, draughts, bagatelle tables, &c. Papier maché lady's work-table, of new form, ornamented and appropriately furnished. Provisionally registered.—

THE DAY DREAMER.—JENNENS AND BETTRIDGE.

The Lotus Work-table, in papier maché, on an improved principle. Provisionally registered. Papier maché Tête-à-tête Chaise Lounge, ornamented with acanthus in white and gold. Bachelor's side-board, on a new principle. An inkstand, with group of deer and hounds, designed by H. M'Carthy, sculptor; and other elegant articles.

The exhibitors' patent process of inlaying mother-of-pearl, consists in pencilling the proposed design upon the piece of pearl, in a vehicle adapted to resist acids, and then removing, by acids, the superfluous portions, leaving only those which are pencilled.

To recover composure in a crisis

Consider the high and rising cost of solvents. Of anything. Of everything.
What can you do without? What, in Heaven's name, can you do?
Sit down, my dear Sir. Dictate a letter to Sutcliffe Speakman: "I am interested in Solvent Recovery. I understand you will either suggest a way of recovering solvent at a profit to my firm, or will say that it cannot be done . . ."
You should now be well on the way to recovering your composure—and your solvent.
But in announcing this to your colleagues, temper your jubilation with urbanity.
After all, you always *were* rather brilliant . . .

SUTCLIFFE SPEAKMAN

SUTCLIFFE, SPEAKMAN & CO LTD · Leigh Lancs · Tel: Leigh 72101 (6 lines) *London Office:* 2 *Caxton St · Westminster · SW1 · Tel: Abbey* 3085

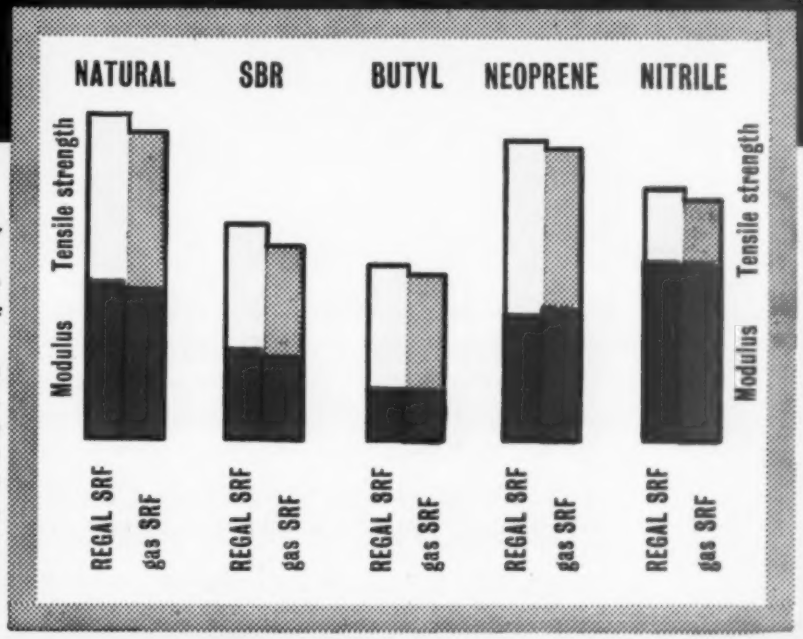
SRF Black from oil?

CABOT

FACTS

REGAL SRF is produced by the new REGAL process — patents applied for — permitting the control of structure at various particle size levels, from oil. Its Particle Size and Surface Area are close to those of PELLETEX and STERLING S, Cabot's long established American gas-SRF blacks. REGAL SRF provides physical properties and processing characteristics typical of gas-SRF types:—

SRF



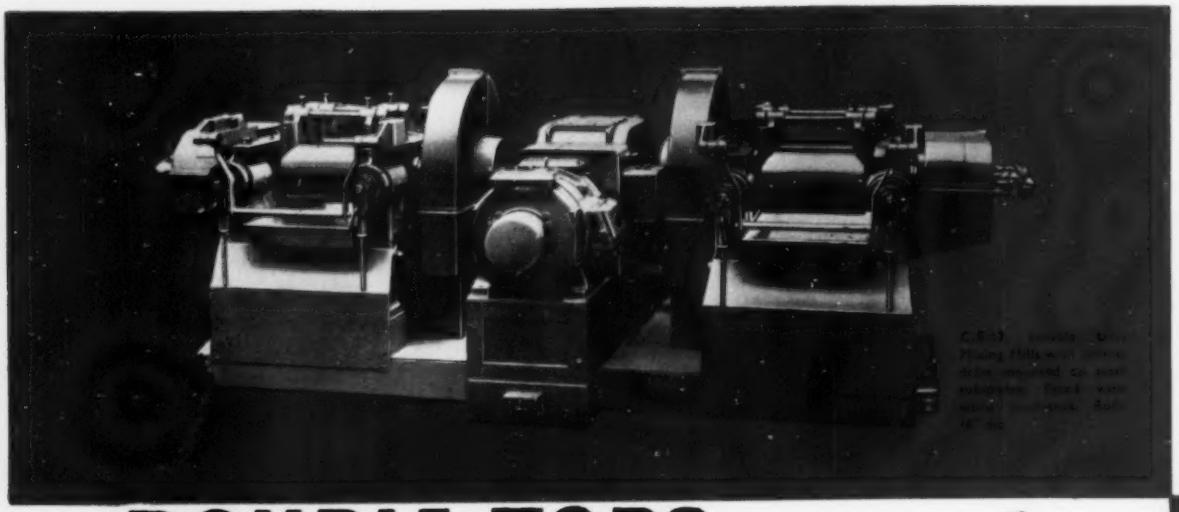
AVAILABILITY

In full production at the Stanlow, Cheshire plant of

CABOT CARBON LTD

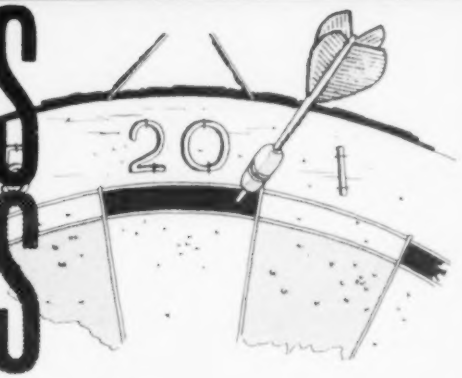
LONDON SALES OFFICE:—
62, BROMPTON ROAD, LONDON S.W.3
Tel: KNightsbridge 7181 (5 lines)
Grams: Cablak, London, Telex

Registered Office & Works
STANLOW, ELLESMERE PORT, CHESHIRE



DOUBLE TOPS

DOUBLE TOPS



INCREASED PRODUCTION—
REDUCED SPACE REQUIREMENTS

It's no longer **BIG NEWS** but
STANDARD PRODUCTION!

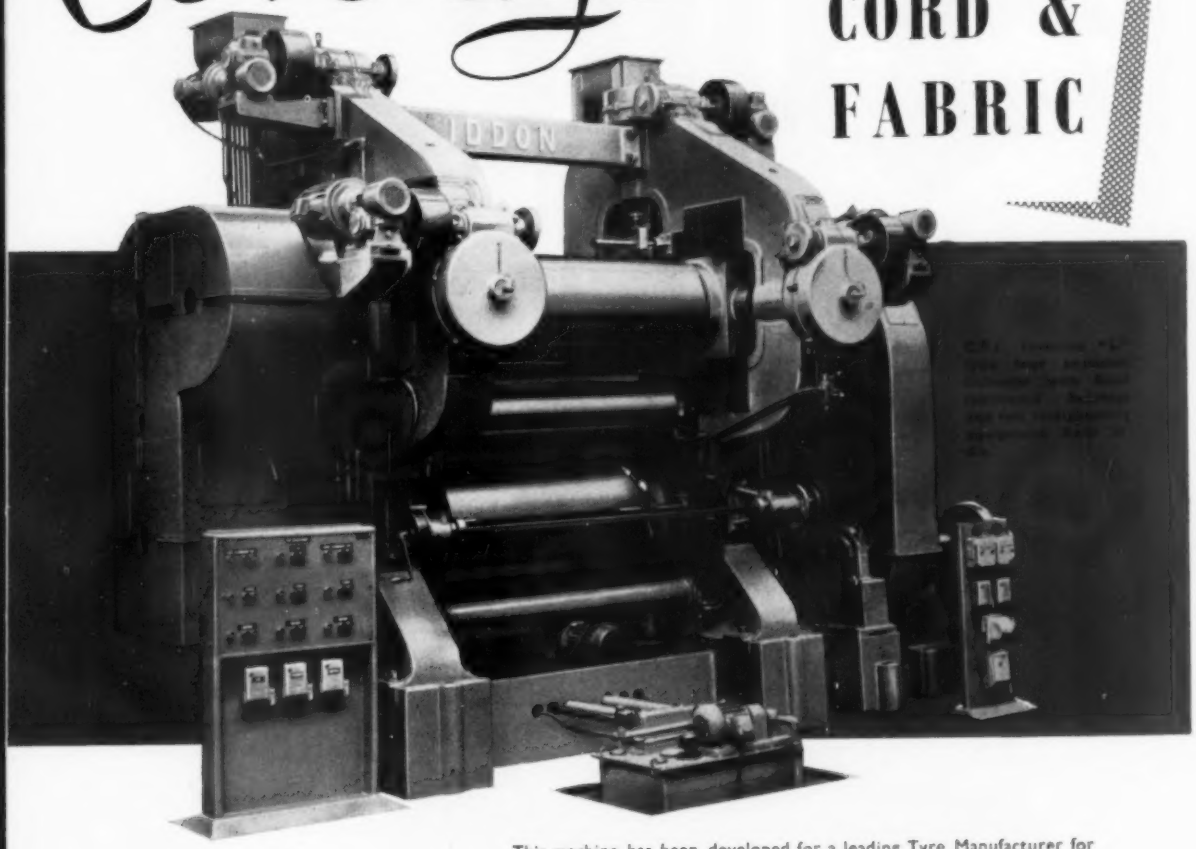
When in 1959 the Double Unit Mill, mounted on vibro insulators, was first introduced by IDDON Bros., it created widespread interest throughout the industry.

This layout has now become an accepted standard of modern factory planning with many repeat orders as proof of satisfaction.

THE CONSULTATION SERVICE OF IDDON'S TECHNICAL STAFF IS FREELY AVAILABLE

MANUFACTURERS OF MIXING MILLS, PRESSES, EXTRUDING MACHINES, CALENDERS

Coverage . . for TYRE CORD & FABRIC



This machine has been developed for a leading Tyre Manufacturer for use in continuous high production of Cord Coverage and is equally suitable for all forms of fabric covering. Repeat orders have confirmed the efficiency of this IDDON designed Calender, which can be adapted to your particular needs.

WORLD -WIDE representation

IDDON
BROTHERS LIMITED

LEYLAND · LANCASHIRE
Telephone: LEYLAND 21258 *Telegrams: IDDON, LEYLAND*

LONDON Representative: Mr. J. SUMMERS, Room 16, 4th floor, Abford House, Victoria, London, S.W.1 Tel. VICtoria 1488

U.S. and CANADIAN Technical Sales and Service: THE JOHN WILLIAMS MACHINERY LTD. 1868, Mattawa Avenue, Cooksville, Ontario, Canada. Telephone: 279-7250

AND AN EXTENSIVE RANGE OF MACHINES FOR RUBBER AND PLASTICS INDUSTRIES

Your SUPPLIER ?

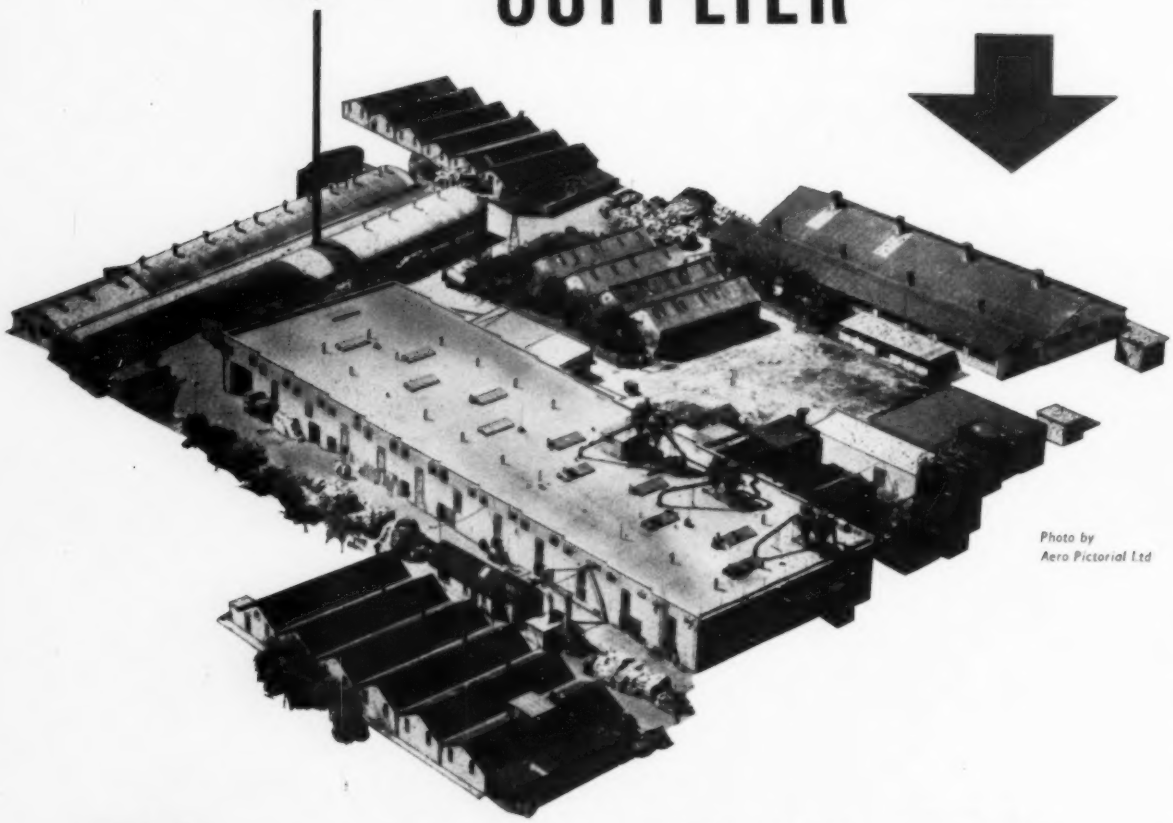


Photo by
Aero Pictorial Ltd

Ebonite DUST

In all qualities to meet your specification

THE LARGEST PRODUCERS JAMES FERGUSON & SONS LTD

LEA PARK WORKS PRINCE GEORGE'S RD · LONDON, S.W.19
TEL: MITCHAM 2283-7 : GRAMS: NESTORIUS, SOUPHONE, LONDON
Sales Offices and Stores in BIRMINGHAM and MANCHESTER

also the makers of:-

NESTORITE PHENOLIC UREA MOULDING MATERIALS AND NESTOR RESINS AND EMULSIONS

NO OTHER RUBBER MIXER RANGE OFFERS SO MUCH AS THE **SHEAR-MIX**

CONTINUOUS POWDER FEED
with *complete* dispersion and *no* dusting

ELECTRICAL CONTROL OF LIQUID FEEDS
Oils and softeners efficiently mixed and no agglomeration

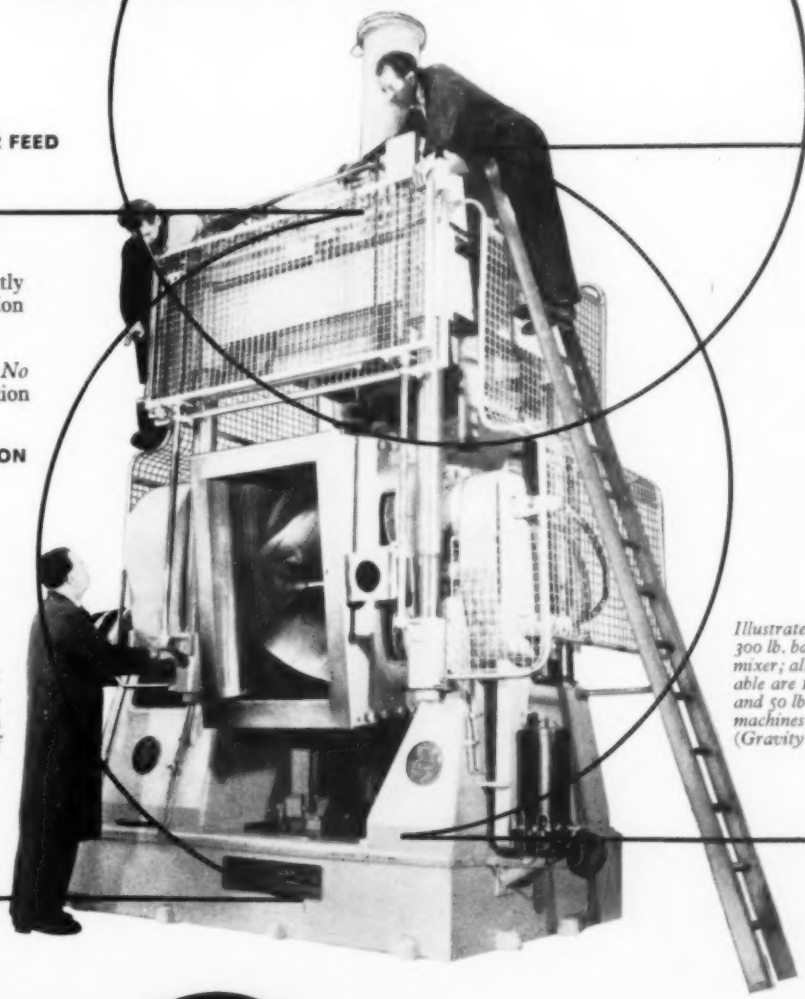
TILT DISCHARGE
Whole batch discharged. *No* batch-to-batch contamination

SPECIAL TROUGH CONSTRUCTION
Better heat transfer
No overstressed areas

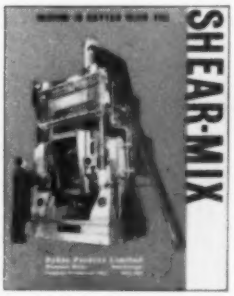
SPECIAL GLANDS
Efficient leak-proof seal ensures *no* lubrication, *no* maintenance needed

DUAL FUNCTION HYDRAULIC
Hydraulic pressure assembly tilts chamber, operates ram. *No* separate source of air needed

FLUID COUPLING
Ensures quieter, smoother running with *no* shock loadings



Illustrated is a 300 lb. batch mixer; also available are 120 lb. and 50 lb. machines (Gravity 1)



SEE WHY FOR YOURSELF!
Write for this 16-page brochure on the Baker Perkins SHEAR-MIX range.

Baker Perkins Limited
WESTWOOD WORKS PETERBOROUGH

B.P.819

OSWALD
and
DUNCAN
Limited

COTTON AND SYNTHETIC YARNS
AND CLOTHS
FOR INDUSTRIAL PURPOSES

Tyre Fabrics · Belt Ducks

Filter Cloths · Hose Ducks

Mayfield Mill · Rochdale

Telephone
ROCHDALE 40221

Telegraphic Address
OSWALDUN · ROCHDALE

only

DAVIS-STANDARD

vertical

CONTINUOUS-VULCANIZATION PLANT

Illustration shows the metering drag capstan and cable lift sheave assembly, 4½" Davis-Standard extruder with vertical head and power-operated splice box.

provides the answer to the problems associated with the production of heavy rubber-covered cables. It also provides the ONLY method of producing heavy-duty Butyl insulated cables.

VERTICAL CV produces cable insulation of better concentricity, more uniform diameter and improved values in dielectric strength and corona level tests.

Let us have details of YOUR production problems—we will be pleased to advise you on this outstanding new method by DAVIS-STANDARD, the leaders in extrusion machinery.

FAWCETT

COMPLETE ANCILLARY EQUIPMENT INCLUDES:—
PAY-OFFS, PRE-HEATING AND VULCANIZING TUBES, SPLICE-BOXES, AUTOMATIC DOUBLE WATER SEALS, HAUL-OFFS, TAKE-UPS.

Please quote ref. No. 166/C in your enquiries

FAWCETT PRESTON & COMPANY LIMITED
BROMBOROUGH, CHESHIRE
Telephone: Rock Ferry 6181
Branch Offices in London and Birmingham

Metal Industries Group

FP 166

HARRISONS & CROSFIELD

LIMITED

1-4 GREAT TOWER STREET · LONDON, E.C.3

Secretaries and Agents of Plantation Companies including producers of **Sole Crepe under H & C mark**

Merchants of Eastern Produce, Industrial Raw Materials and Heavy Chemicals

Concessionaires of

LINATEX

the non-ageing rubber material for engineering uses

Selling Agents for

H & C LATEX LIMITED

Suppliers of Concentrated (Centrifuged) Latex

Sulphur And Factice

FOR HOME AND EXPORT

POWDERED SULPHUR

Specially prepared to meet specifications in Rubber Compounding, including Latex.

Brands:

BLACK STAR RED STAR
GREEN STAR BLUE STAR

FACTICE

The best plasticiser for proofed and extruded goods. It gives supple handle and smooth finish, aids processing and restrains bloom.

Grades:

WHITE GOLDEN
BROWN SPECIAL

For All Requirements

Our Technical Department is at your service.

as ALFRED SMITH LTD · STONEFERRY · HULL

Telephone: Central 47371 (9 lines) Telex No. 52265 Cables "Bisulphide" Hull

WORKS: Oak Road, Newland, Hull Telephone: Central 16880

LONDON: 88 Leadenhall Street, E.C.3 Telephone: Avenue 4081-3

TUFTED
CARPET
YARNS
AND
COTTON
AND
SYNTHETIC
FABRICS
FOR
THE
RUBBER
ELECTRICAL
AND
CHEMICAL
TRADES

JOHN BRIGHT & BROTHERS LTD.

SPINNERS DOUBLERS AND MANUFACTURERS

ROCHDALE

TELEPHONE: ROCHDALE 4141 (5 LINES)

TELEGRAMS: 'BRIGHTS' ROCHDALE

ESTD. 1809

To-day's big rubber news comes from **I.S.R.**

NOW IT'S

Diene RUBBER

Stereospecific • Low hysteresis
Highest purity • Narrow molecular weight distribution • Stable price • EX STOCK

DIENE is a new stereospecific polymer with remarkable properties. DIENE is a new elastomer—it has properties which cannot be matched. DIENE is outstanding in four vital qualities—resilience, abrasion resistance, low temperature characteristics and purity.

DIENE's primary use is in compound with other rubbers, when the compound acquires the most valuable DIENE properties. 50% DIENE compounds are characteristic; greater or lesser proportions are of course usable. In production DIENE is economical, it can be readily extended with any of the usual extenders or fillers. DIENE's purity is of special value to the electrical industry, but in any application it results in excellent colour.

In truck tyre applications DIENE has now undergone several millions of test miles and its value is established beyond doubt. Proved in tyres, DIENE is now ready for other products—electrical, footwear, domestic, industrial—*and in production quantities.*

DIENE is available NOW, Ex Stock, from I.S.R.

Please write for full details.

The International Synthetic Rubber Co. Ltd.
Southampton · Tel: Blackfield 3141 · Cables: INTOL HYTHE
London · Tel: Langham 0711 · Cables: INTOLRUB LONDON
Manchester · Tel: Pyramid 1241 · Cables: INTOL MANCHESTER

'Diene' is a registered trade mark of FIRESTONE SYNTHETIC RUBBER & LATEX COMPANY AKRON, OHIO, U.S.A. *I.S.R. are U.K. sole agents for Diene*

Whatever your walk in life.....

English china clays come into it somewhere. In the thousand and one articles made of rubber that are part of everyday life—rubber soles, floor tiles, bungs and stoppers, sealing strips, cables and belts and a multitude of others—there you will find china clay being used as a reinforcing filler.

China clays being chemically inert, and of fine particle size, are easily dispersed in the rubber compound and make very effective and inexpensive reinforcing fillers for both natural and synthetic rubbers.

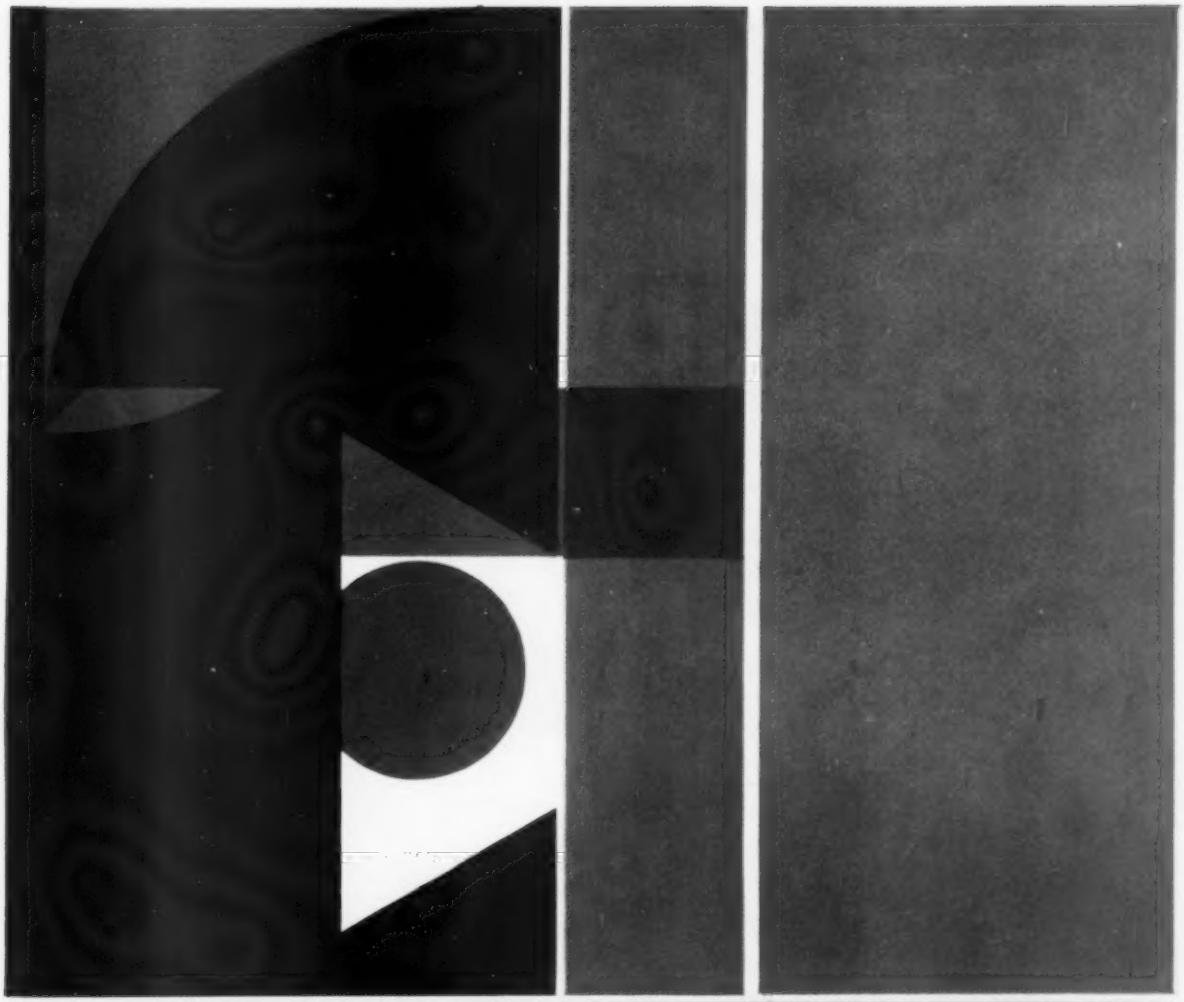
There are rubber-reinforcing clays to meet almost every requirement of the rubber manufacturer, so why not write now for full technical details, samples and prices to:-

ENGLISH CLAYS, LOVERING, POCHIN & CO. LTD

ST. AUSTELL CORNWALL

Branches: London, Manchester, Edinburgh, Newcastle (Staffs.), Brussels, Paris, New York, Leominster

TSH.RP/1



I.C.I. introduce four new high-quality chemicals and auxiliaries for the rubber industry.

NONOX ZA — powerful antiozonant
NONOX EXP — non-staining antioxidant in an attractive bead form
NONOX B Rods — general purpose antioxidant in a convenient rod form
VULCAFOR LS ACCELERATORS — in wet-cake form and in small-particle size for latex compounding

Already well known in the industry are
Vulcafor accelerators · Vulcamel peptiser · Nonox antioxidants · Vulcatard retarder · Vulcabond bonding agents · Vulcafor colours · Vulcacel blowing agents · Vulcaprene lacquers and synthetic rubbers · Vulcastab stabilising, wetting and thickening agents · Dispersol dispersing agents

Long experience and extensive knowledge of the industry enables ICI to provide unrivalled technical service

Full information on request:
IMPERIAL CHEMICAL INDUSTRIES LIMITED LONDON SWI ENGLAND

ICI

X325

AKRON TYRE MACHINERY

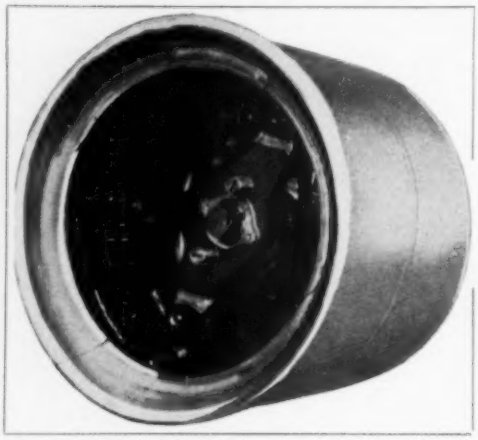
New Spacer Type Tyre Building Drums

for

PASSENGER

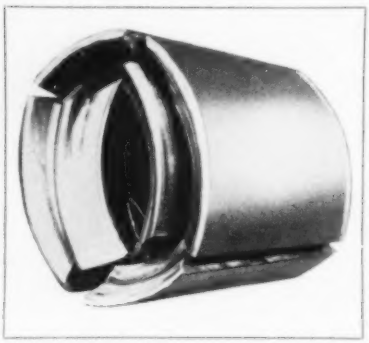
and

TRUCK TYRES



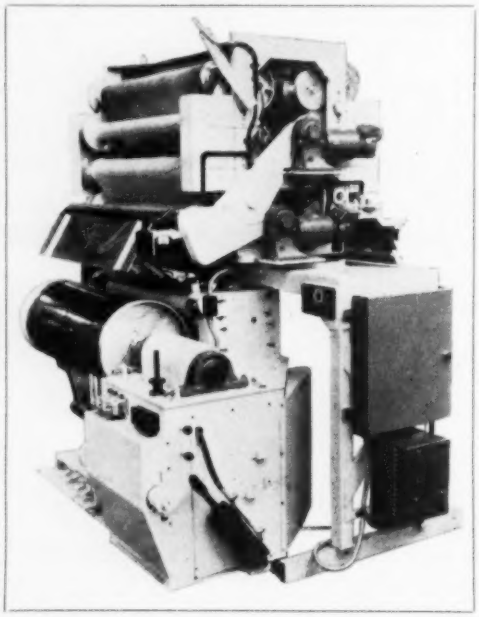
Drum Expanded

4 Ply 48" Band Building Machine with "Servicer" Head



Automatically Collapsed

* NO GAP SHIELD
* NO AIR POCKETS
* NO DAMAGED INNER LINERS
* SMOOTH BUILDING SURFACE
* QUICK, POSITIVE WIDTH ADJUSTMENT



Automatic Feed of Stock and Squeegee with Accurate Band Measurement

Also:—

Tyre and Tube Moulds
Tyre Building Machines and Servicers
Mill Batch-off Machines
Mill Blenders
Tread Splice Presses
Automatic Guillotines

THE AKRON STANDARD OF THE WORLD

AKRON STANDARD (ENGINEERS) LTD.

NEWSTEAD · TRENTHAM · STOKE-ON-TRENT

TELEPHONE: STOKE-ON-TRENT 57335 6

CABLES: AKRON, STOKE-ON-TRENT

Down Comes Chlorobutyl...

You can now get a lot more Chlorobutyl for your money. In full commercial production, it costs only 2/6 a lb ex store, duty paid. Chlorobutyl—now known as Chlorobutyl HT10-66—offers several advantages: compatability with other elastomers; increased cure rate; and wider choice of cure systems. Chlorobutyl HT10-66 has already been used with considerable success in America for tubeless tyre inner liners and non-toxic compounds for food containers, high-temperature steam hose, conveyor belting, and various moulded and extruded items. Samples and details of compounding and applications are available from:

Chemicals Division, Esso Petroleum Company, Ltd, 50 Stratton St, London W1. Phone: HYDe Park 7030.

Esso CHEMICALS

ESSO MEANS BUSINESS IN CHEMICALS

B1

The high abrasion furnace black for all rubber products requiring extra toughness and resistance to wear.

also

KOSMOS 45 GPF

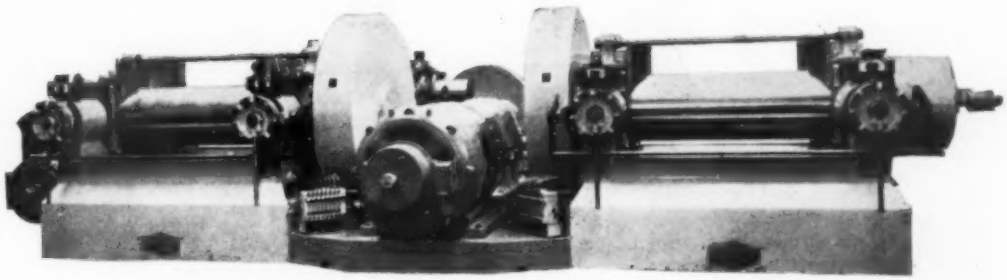
Low-priced, easily processed, suitable for a wide range of products.

CHANCE & HUNT (Proprietor: Imperial Chemical Industries Limited)

5/7 ST HELEN'S PLACE, LONDON, E.C.3

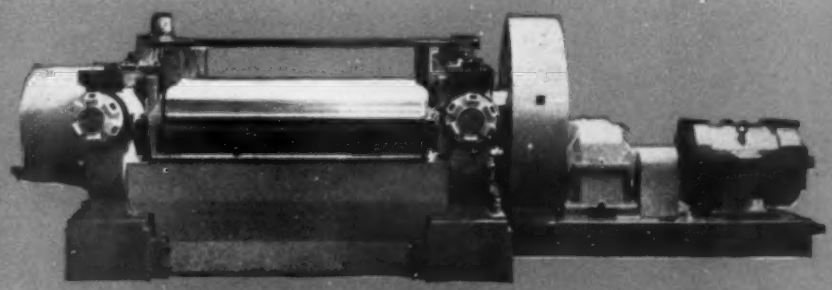
ROBINSON

SPECIALIST ENGINEERS TO THE RUBBER AND PLASTIC TRADE



A new Standard Design 22" x 60" Twin Mill arrangement on a Cast Iron Combination Vibro Mounted Bedplate with 200 H.P. Central Drive having a Spiral Bevel Helical Reduction Unit and Motor with Plug Braking Reversing Contactor Control and Lunn Type Low Position Safety equipment.

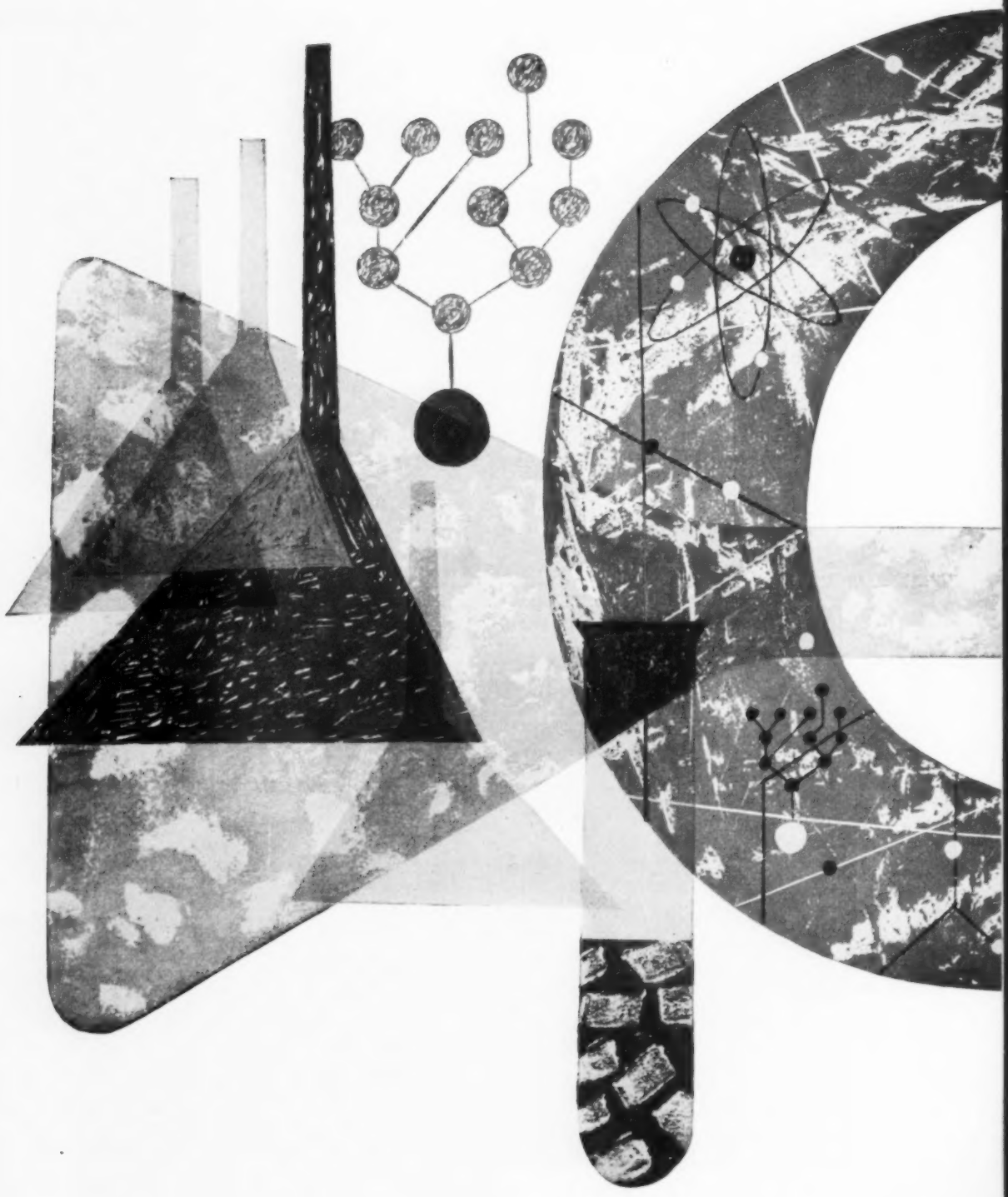
Special Mill design to include customers' particular specification ably dealt with by proficient and fully experienced personnel.



26" x 26" x 84" Mixing Mill with Cast Iron Combination Bedplate, Vibro Mounted and 150 H.P. Drive including D.H. Reduction Unit and Slipring Motor with reversing Contactor Control, suitable for emergency plug braking and Lunn Safety Equipment. Lubrication to Main Bearings by Wakefield Motor Driven Forced Feed Unit.

JOSEPH ROBINSON & CO. LTD. ESTABLISHED 1842

Tel: BLA 1866/7 SPRINGFIELD LANE SALFORD 3 · LANCS · ENGLAND *'Grams: Opal M/C*



Seek for the reasons behind the growing demand for Geon
and immediately you are immersed in Geonology.
Though the word means many things in many industries,
Geonology is best defined as the special science
which has fashioned Geon into the finest range
of PVC materials . . . made it capable of assuming many shapes,
fulfilling many tasks. Thus Geonology embraces more than
the transmutation of coal, limestone, salt water and oil —
taken 'out of the earth' (Greek root 'Ge').
It is the sum of all the technical knowledge,
the research, development and production skills, the testing
and re-testing procedures . . . in fact of all those things
that make Geon today's most dependable PVC.

Geonology – its evolution

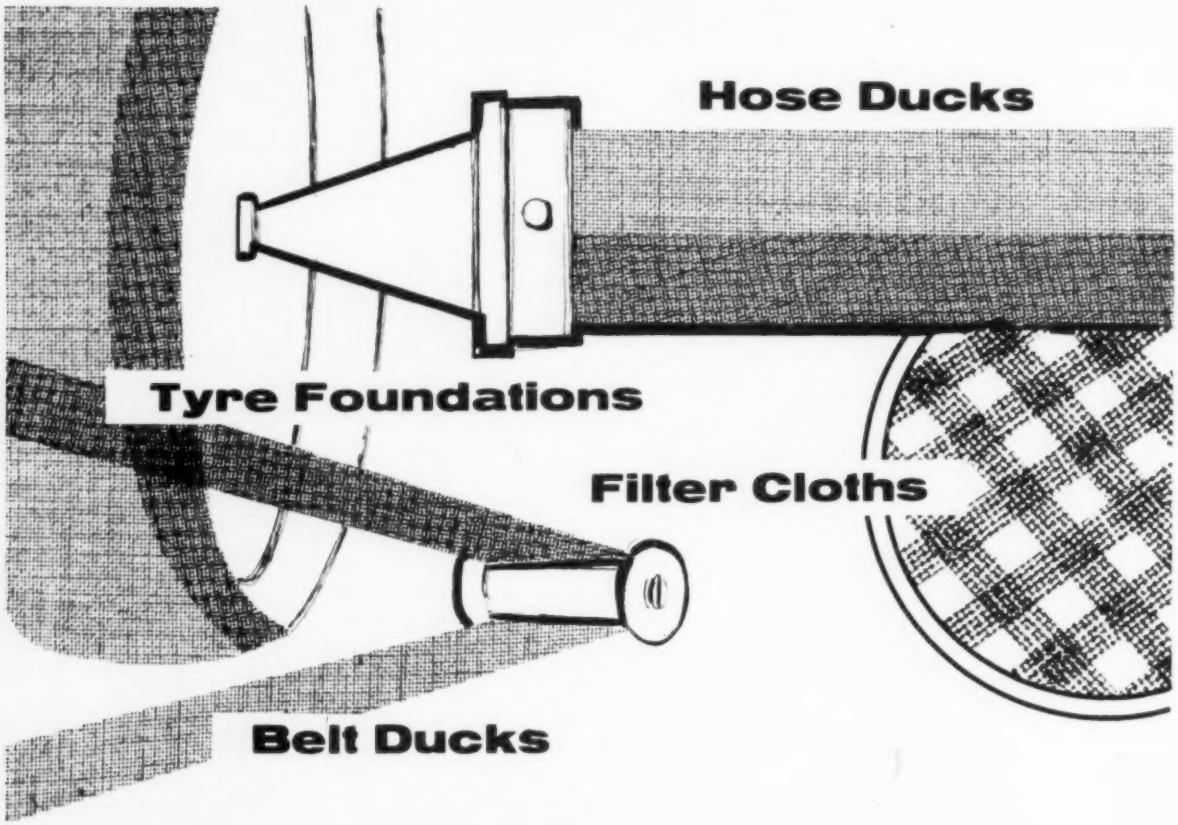
Many of its features and uses are shown and described
in a booklet called 'The Geon Story'.
Write for your copy today.

Geon is a reg'd trade mark Geon

British Geon Ltd A COMPANY IN THE DISTILLERS PLASTICS GROUP

SALES AND TECHNICAL SERVICE DEVONSHIRE HOUSE PICCADILLY LONDON W1 HYDE PARK 7321

Distillers Plastics Serve Everyman



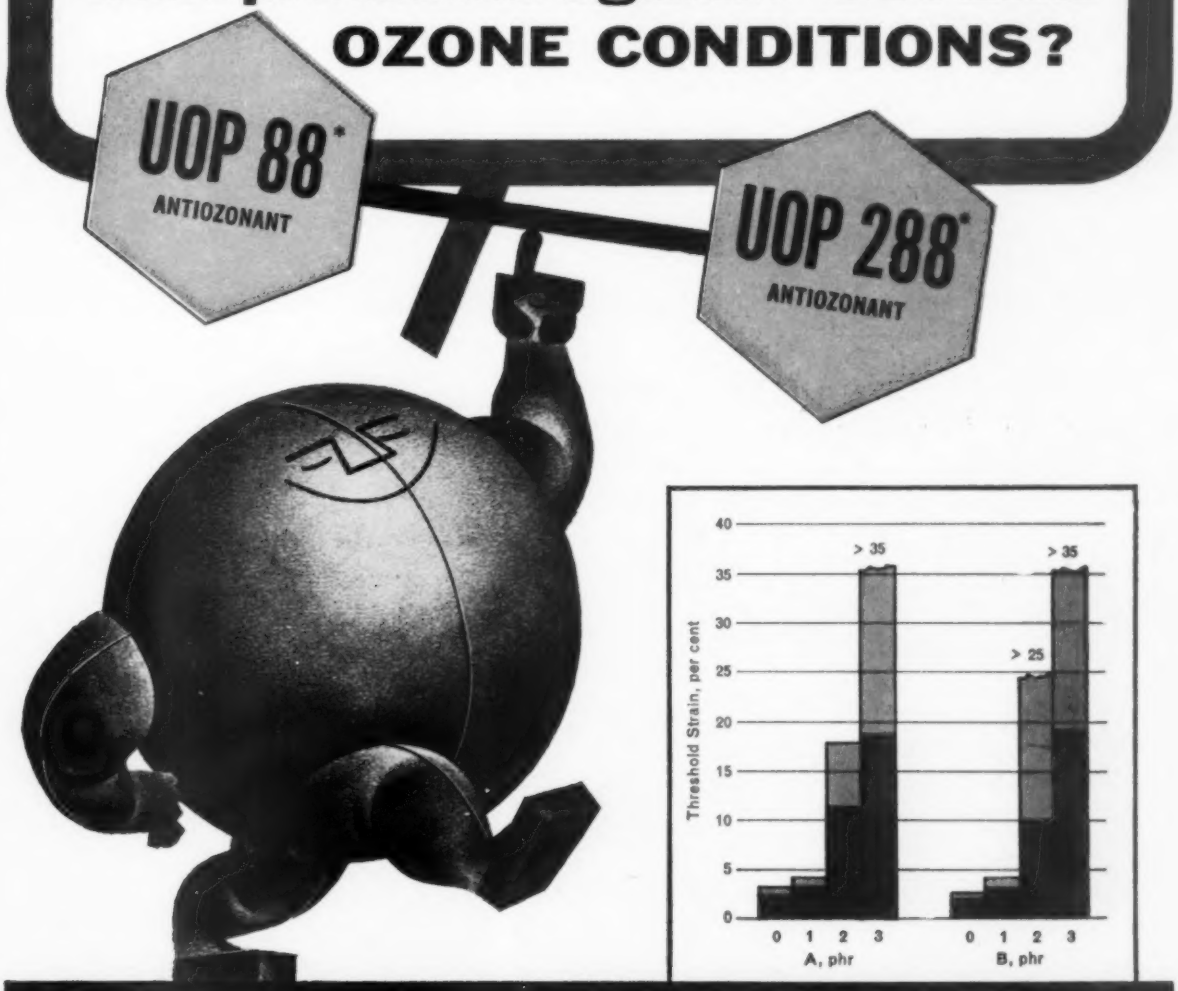
Tyre Foundations **Tarpaulin Canvas & Sail Cloths** **Liner & Wrapper Cloths** **Filter Cloths** . **Transmission & Conveyor Belting Ducks** **Hose Fabrics** **Boot & Shoe Materials** **Protective Clothing** **Fabrics for Rubberising Plasticising and Laminating Purposes** **Printers' Blanket Wigans**

Hay & Robertson

Whatever your fabric requirements or problems consult Hay & Robertson at

St. Margaret's Works, Dunfermline
Telephone: Dunfermline 1
Telegrams: 'HAY' Dunfermline
London Office: 74 Cheapside, E.C.2. Tel: CITY 5901

how can rubber be best protected against SEVERE OZONE CONDITIONS?



severe conditions of ozone and stress call for extra-special protection . . .

Smog which may contain up to 100 pphm ozone is hard on health and disposition. It is equally hard on rubber products. High ozone levels cause severe cracking in rubber formulations. In addition, stress also contributes to this problem as shown in chart. How do you prevent such deterioration, assure long service life for your product under severest service conditions?

First, use antiozonants UOP 88 or 288, which offer maximum ozone protection. A relatively small loading of these low-cost antiozonants goes a long way in providing increased protection.

Ozone concentration is but one of many factors to consider in manufacturing antiozonant-containing rubber products. Our staff of specialists, backed by UOP laboratory facilities and field experience, will be happy to discuss your problems with you. Simply write or telephone our Products Department.

40 pphm ozone 120 pphm ozone

Chart above shows effects of increasing antiozonant content of SBR stocks to meet increasing ozone level.

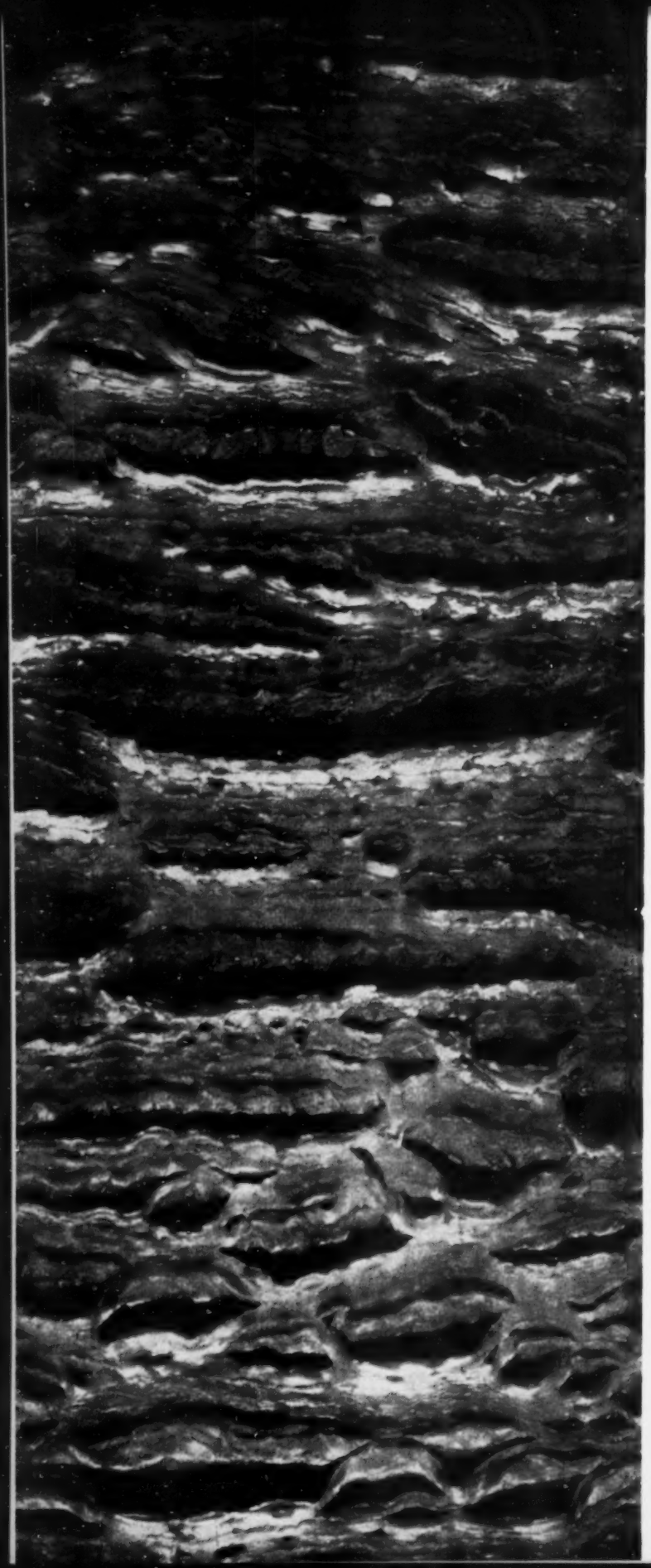
UOP

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road,
Des Plaines, Illinois, U.S.A.

Available in England through Universal-Matthey Products Limited, Stockingswater Lane, Brimsdown, Enfield, Middlesex
Telephone: HOWard 4066/7/8 · Cables and Telegrams: Unimatthey, Enfield · Registered Office: 78 Hatton Garden, London, E.C.1

* *Registered Trademark of the Universal Oil Products Co.*

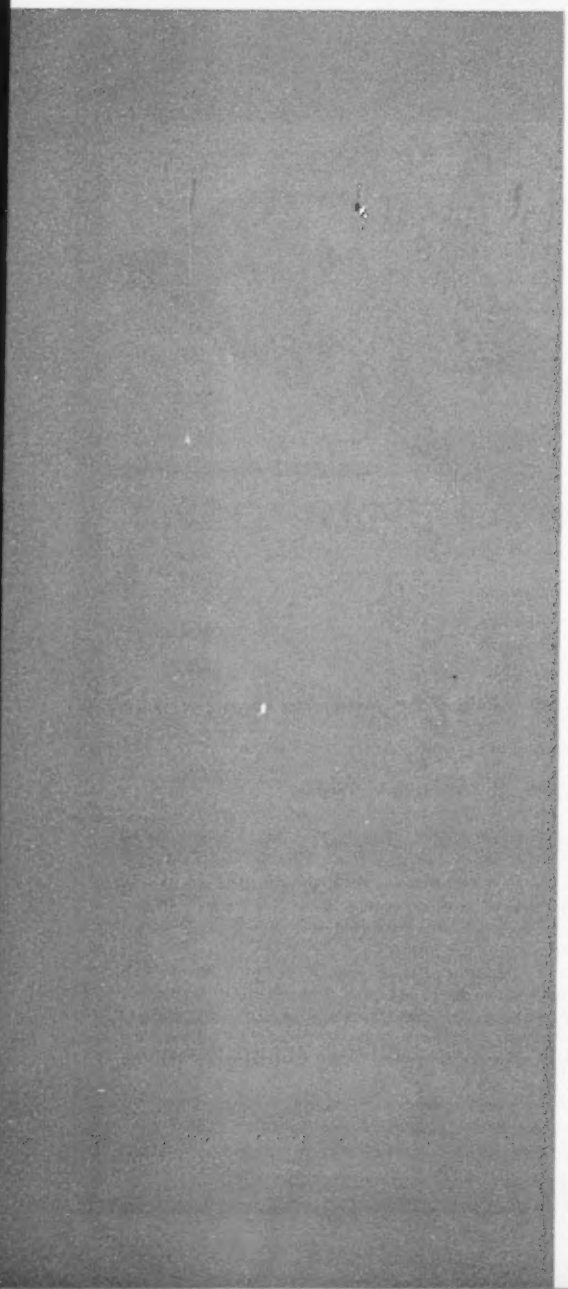


photograph of pure rubber

master batches
natural and synthetic
reclaimed rubber
rubber compounds
lead compounds
factice
colargiles
organic colours
chemicals for rubber

BRR

serving the Rubber Industry since 1872



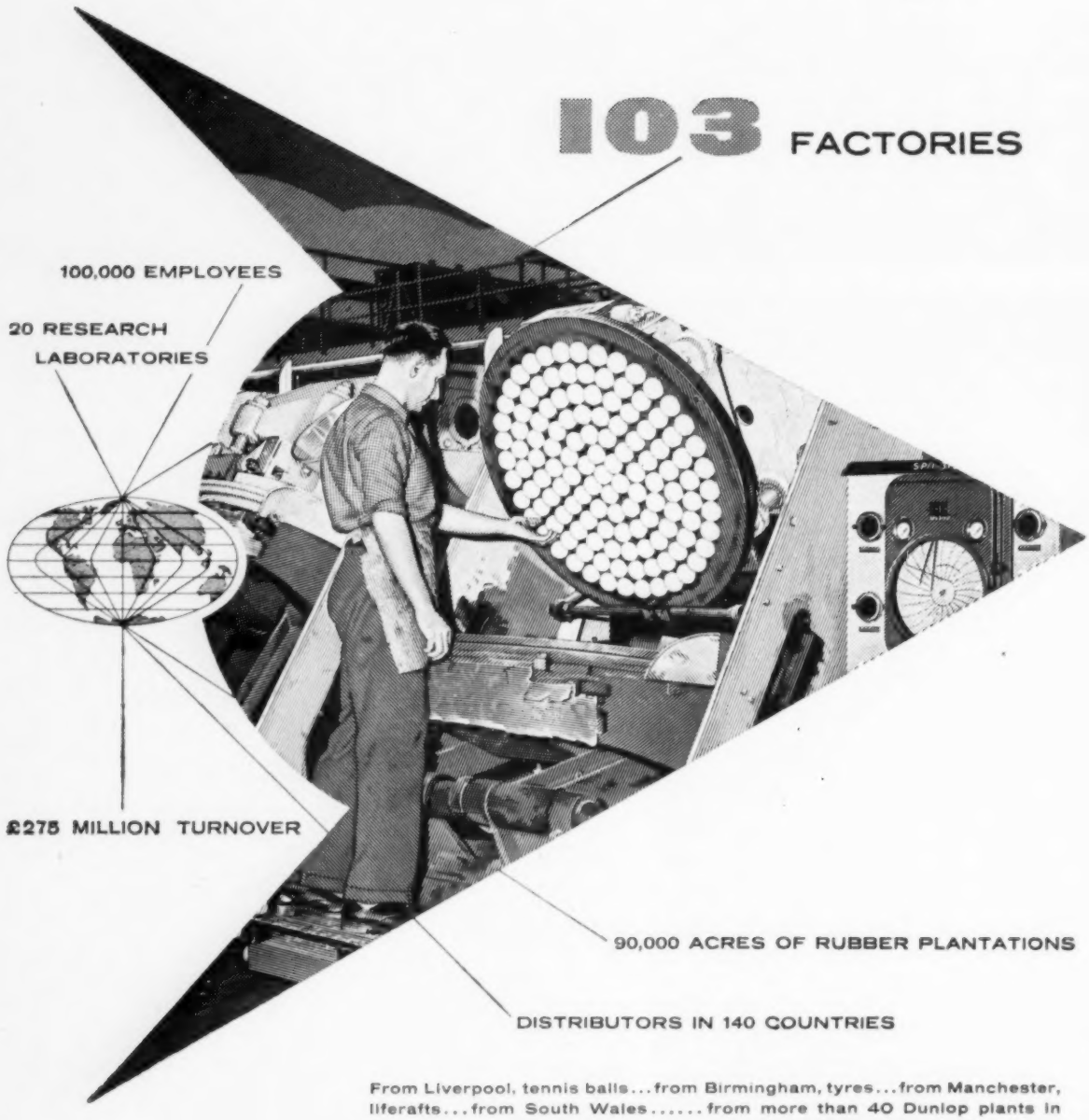
Opposite is a photograph of a section of raw rubber. Since 1872 B.R.R. have been processing all types and grades of rubber to customer requirements and specifications. A vast wealth of practical knowledge of processing and handling is therefore available.
A specially equipped laboratory with all the very latest mechanical aids is available to you, through our technical advisory service. Your enquiries will command our immediate attention.

BRITISH RECOVERED RUBBER & CHEMICAL CO LTD
Ashton New Road Clayton Manchester 11
Telephone East 3241-6
Telegrams 'Reclaimed Manchester'
Telex 66491

Southern Office
Barclays Bank Chambers
1 High Street St. Albans
Telephone St. Albans 50416-7
Telex 24173

Scottish Office
R M Wilson
227 St. Andrews Road
Glasgow S 1

BEHIND THE DUNLOP SYMBOL



From Liverpool, tennis balls... from Birmingham, tyres... from Manchester, liferafts... from South Wales..... from more than 40 Dunlop plants in Britain come a vast range of consumer and industrial goods. And in a dozen overseas countries the Company's new symbol identifies equally diversified and continually expanding manufacturing activities.

Only last year new factories in France, India and Rhodesia went into production, and plans were advanced for a second tyre factory in Japan. These resources and developments behind the Dunlop symbol are reflected in the progress of motoring, aviation, mining and countless other industries —and in the greater comfort and convenience we all enjoy in our daily lives.

DUNLOP SYMBOL OF PROGRESS

CPH/PRA/54

DID YOU KNOW THAT DU PONT MAKE ALL THESE ELASTOMERS

NEOPRENE

General Purpose Types:—

†GS †WHV
†GRT †WX
†W †WRT
WB

Special Purpose Types:—

AC Designed for cements. Crystalizes rapidly.
AD Similar to AC but lighter original colour.
CG Similar to AC but not as stable.
FB Fluid elastomer for use in caulking compounds, and high solids solvent cements.
KNR Used for solvent solutions, ideal for brushing cements.
S Tough, high viscosity neoprene.

†These neoprene types are now produced in the United Kingdom.

NEOPRENE LATEX

General Purpose Types:—

571
750
650
†842A
†601A

Special Purpose Types:—

60 High solids latex designed for foam products.
572 Specially designed for adhesives.
673 Similar to 572 but crystalizes more rapidly and gives strength faster.
735 Designed for treatment of cellulosic paper.
736 Designed for treatment of paper pulp.
635 High solids form of Type 735.
950 For use where a cationic latex is required.
400 High heat, tear and ozone resistance.

†These neoprene types are now produced in the United Kingdom.

HYPALON*

20 For blends with other elastomers and for solution coatings on flexible substrates.
30 Primarily for solution coatings on rigid substrates, excellent oil resistance.
40 Designed for extruded, moulded and calendered goods.

VITON*

A Designed for high temperature strength.
AHV High viscosity and slightly more stable than 'A'.
B Better thermal stability and chemical resistance.

* Registered trademarks of Du Pont elastomers.

ELASTOMERS

DU PONT

REG. U.S. PAT. OFF.
Established 1802

BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

Du Pont Company (United Kingdom) Ltd.,
76 Jermyn Street, London, S.W.1, England

WASTE RUBBER

AND

PLASTICS

OF EVERY KIND

BERNARD CHASE

ST. KATHARINE'S HOUSE, 69 MARK LANE, LONDON, E.C.3

Telephone : ROYal 0291 Cables : Mulbright, London

RUBBER COMPOUNDING INGREDIENTS

"CALSIL AX" Calcium Silicate, Activated Calcium Carbonate, "SILOL" Aluminium Silicate, Accelerators, Plasticisers, Softeners, Compounds, Masterbatches, Factice, Coumarone Resin, Mineral Rubber, Cable Waxes, Colours, Metallic Stearates, Talc, Powdered Whiting, Precipitated Whiting, Iron Oxide, Zinc Oxide, Antimony Sulphides, Reclaimed Rubber, "PULVERITE" Black Filler, Mould Lubricant, etc.

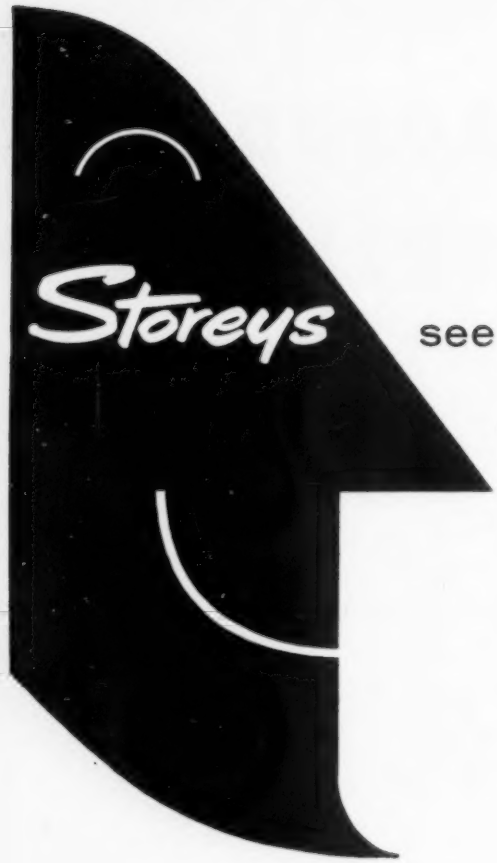
We invite your enquiries for these or any other raw materials for the rubber industry, and will be pleased to submit quotations and samples for your approval

WILFRID SMITH
LIMITED

16 PHILPOT LANE, LONDON, E.C.3

TELEPHONES: MANsion House 2064-8

TELEGRAMS: ACCOLLYST, BILGATE, LONDON



see you through your problems...

Storeys range of vinyl materials offers a solution to almost any design or manufacturing problem —even to applying a durable, attractive covering to any shape (product or component) as odd as a stiletto heel—speedily and economically. In the fashion field, Storeys spectacular new material, Neolan, offers exciting possibilities for garments and fashion accessories. For outdoor use, Plastolene, the tough reinforced vinyl film, made up into garden furniture, shop blinds, awnings and swimming pools is making exteriors more glamorous. And for domestic use, Storeys gay, labour-saving Con-Tact self-adhesive plastics, together with many decorative vinyl curtaining and upholstery materials, are making every home more delightful to live in.

pioneers of modern plastics

Storeys OF LANCASTER

White Cross, Lancaster
Telephone: Lancaster 3232
Telex No: 6587

The Sign of Craftsmanship in Rubber

For quality and reliability in

SURGICAL RUBBER APPLIANCES

and

FINE RUBBER GOODS

World Wide Reputation for Over 90 Years . . . .

FRANKLIN'S

SURGICAL RUBBER APPLIANCES
SURGEONS' RUBBER GLOVES
ANTI-STATIC RUBBER PRODUCTS FOR OPERATING THEATRES
SYRINGES OF ALL TYPES
CATHETERS, RUBBER AND PLASTIC
AIR AND WATER BEDS AND CUSHIONS, ETC.
'X' RAY GLOVES AND APRONS

J. G. FRANKLIN AND SONS LTD

INCORPORATING WILSON RUBBER CO.

BIRKBECK WORKS, LONDON, E.8

Phone: Clissold 6571/4

CABLES, EXPANDING, HACK, LONDON

Manosperse

for

LOWER MIXING TEMPERATURES

FASTER PROCESSING

LOWER EXTRUSION TEMPERATURE

LESS SCORCHING

use

MANOSPERSE 'A'

The outstanding processing aid for hard non-black mixes.

MANOSPERSE 'L'

For dispersion and processing problems in tough black stocks.

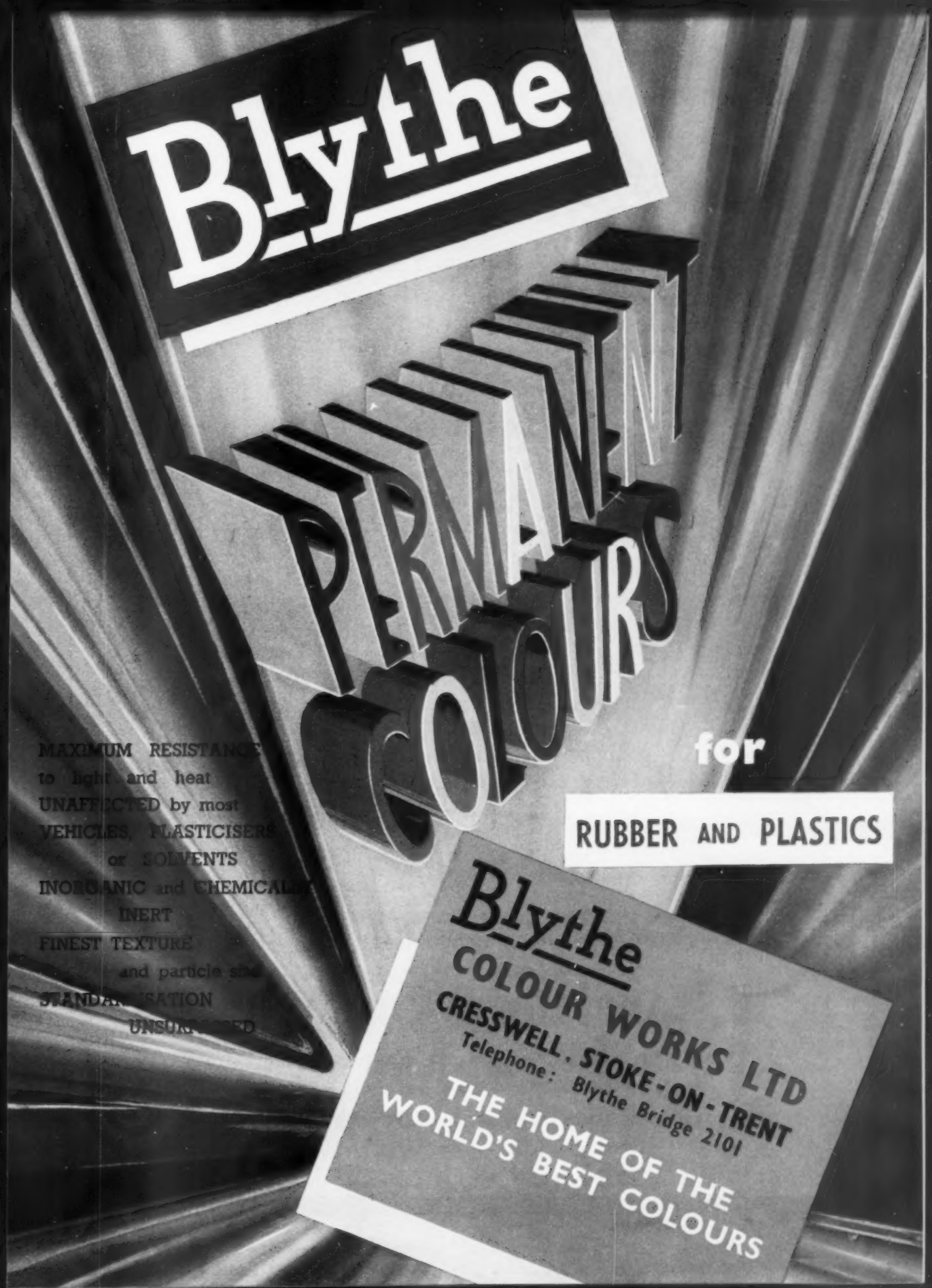
MANOSPERSE 'T'

Ideal for transparent or light coloured compounds.

MANOX

HARDMAN & HOLDEN LIMITED

Manox House, Miles Platting, Manchester, 10
Tel: COLlyhurst 1551 (10 lines)
Telegrams: 'Oxide' Manchester


Blythe
PERMANENT COLOURS
for
RUBBER AND PLASTICS
MAXIMUM RESISTANCE
to light and heat
UNAFFECTED by most
VEHICLES, PLASTICISERS
or SOLVENTS
INORGANIC and CHEMICALLY
INERT
FINEST TEXTURE
and particle size
STANDARDISATION
UNSURPASSED
Blythe
COLOUR WORKS LTD
CRESSWELL . STOKE-ON-TRENT
Telephone: Blythe Bridge 2101
THE HOME OF THE
WORLD'S BEST COLOURS

Harrisons

SPECIALISTS IN THE SUPPLY OF RAW MATERIALS
TO THE RUBBER AND ALLIED INDUSTRIES
AT HOME AND ABROAD

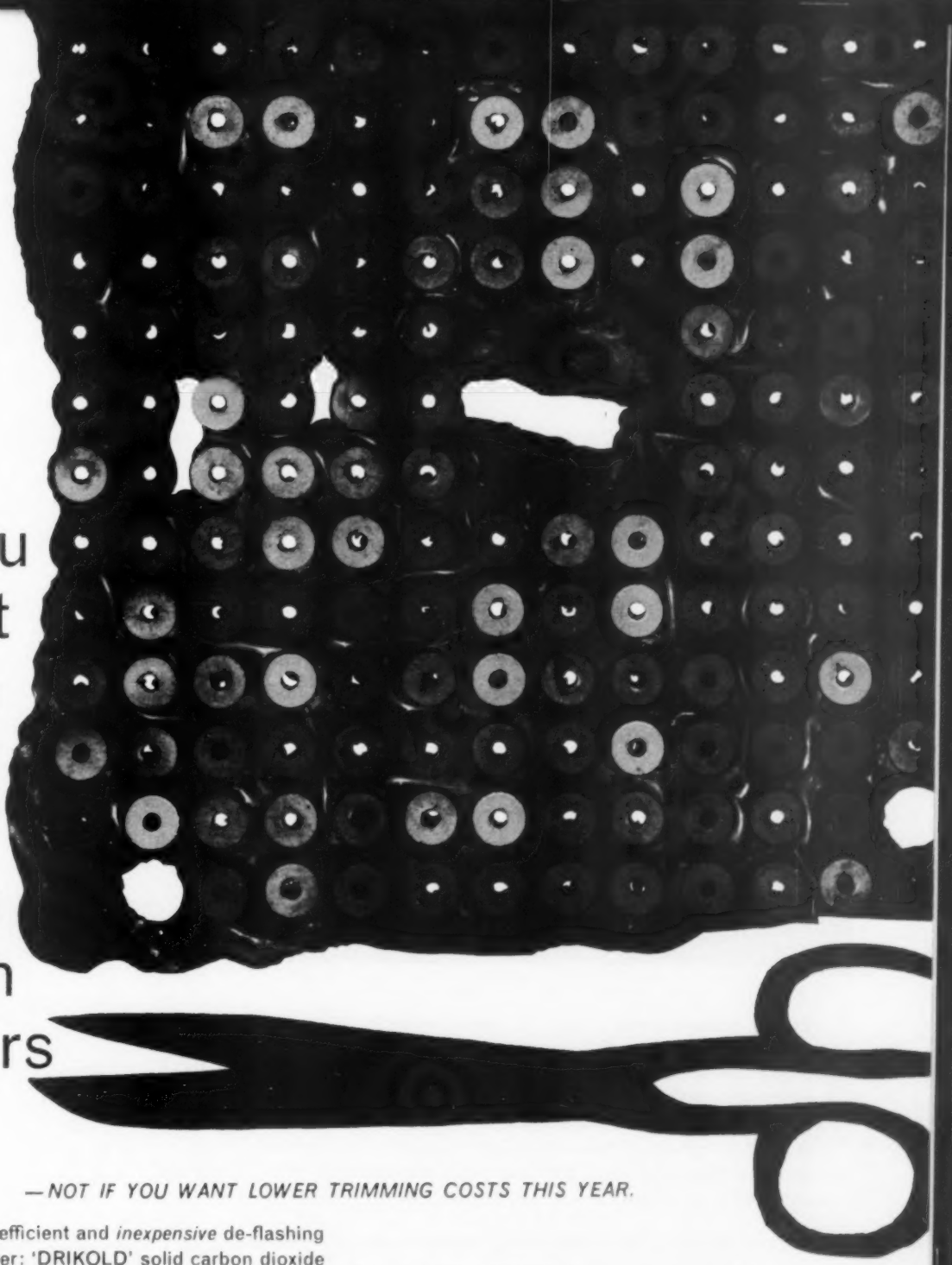
- ASBESTINE
- ASBESTOS POWDER
- BARYTES
- BLANC FIXE
- CLAYS
- COUMARONE RESINS
- FACTICES
- FRENCH CHALK
- IRON OXIDES
- PRECIP. CHALK
- P.V.C. STABILIZERS
- STEARATES
- SYNTHETIC RESINS
- TALC
- WHITING

WE SHALL WELCOME AN OPPORTUNITY OF
QUOTING FOR YOUR REQUIREMENTS

W. Harrison & Company Ltd

12 BROADWAY, LONDON, S.W.1
Tel: ABBey 3221/3 Grams: Nosirrah, Sowest, London

70 THE ALBANY, OLD HALL STREET, LIVERPOOL, 3
Tel: Central 4227 Grams: Nosirrah, Liverpool



you can't run round this lot with scissors

—NOT IF YOU WANT LOWER TRIMMING COSTS THIS YEAR.

For really quick, efficient and *inexpensive* de-flashing there's only one answer: 'DRIKOLD' solid carbon dioxide used with the Columbian International sub-zero tumbler. 'DRIKOLD' freezes rubber mouldings so that the flashes become brittle and break off as the drum of the tumbler rotates. Many small mouldings—even complicated ones—can be de-flashed in this way. Why not ask us to de-flash a sample batch for you? Just fill in the coupon and we'll arrange the rest.

IMPERIAL CHEMICAL INDUSTRIES LTD.,
LONDON, S.W.1.

ICI

To: IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

Please arrange to de-flash a sample batch of mouldings ☐
Please send me your literature on de-flashing with 'Drikold' ☐
I should like further information about the Columbian International sub-zero tumbler ☐

Tick as required

NAME .....

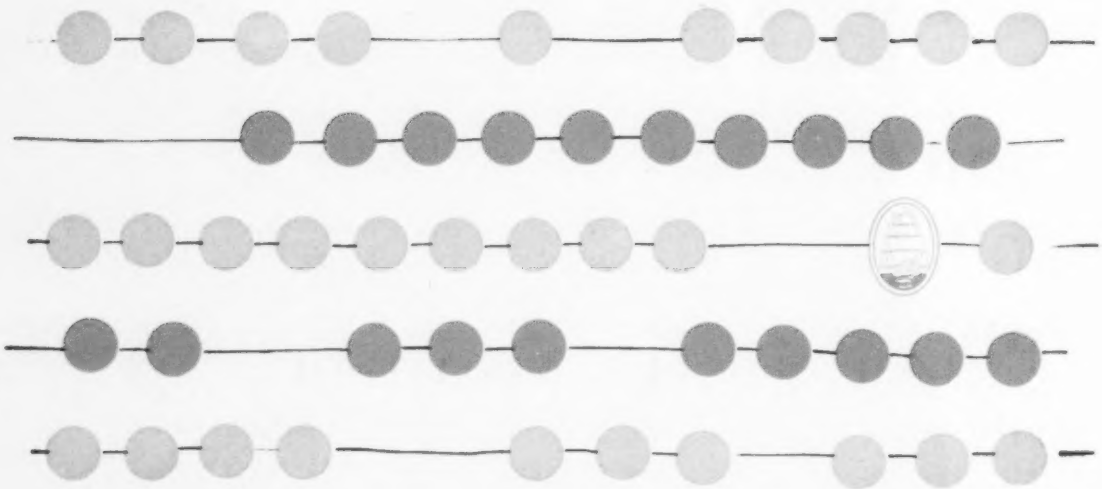
ORGANIZATION .....

ADDRESS .....

.....

DK342

beads you can count on...



Stearic acid—a ton at a time! . . . child's play to move and handle in the form of Stearex Beads. Packed by Price's especially for the rubber industry in standard size non-returnable bags, a ton of Stearex Beads loaded on a pallet takes only seconds to offload and run into store.

And at no extra cost over other Stearic acid forms, Stearex Beads (made by Price's for Columbian International) offer these extra advantages:—

FREE FLOWING—ideal for handling by manual or pneumatic methods

NO DUSTING—does not dust in the same way as powder

NO CAKING—less liable to cake on storage

CONSTANT WEIGHT/VOLUME RATIO—makes for easier measuring

Stearex Beads have Price's name for quality and reliability behind them.

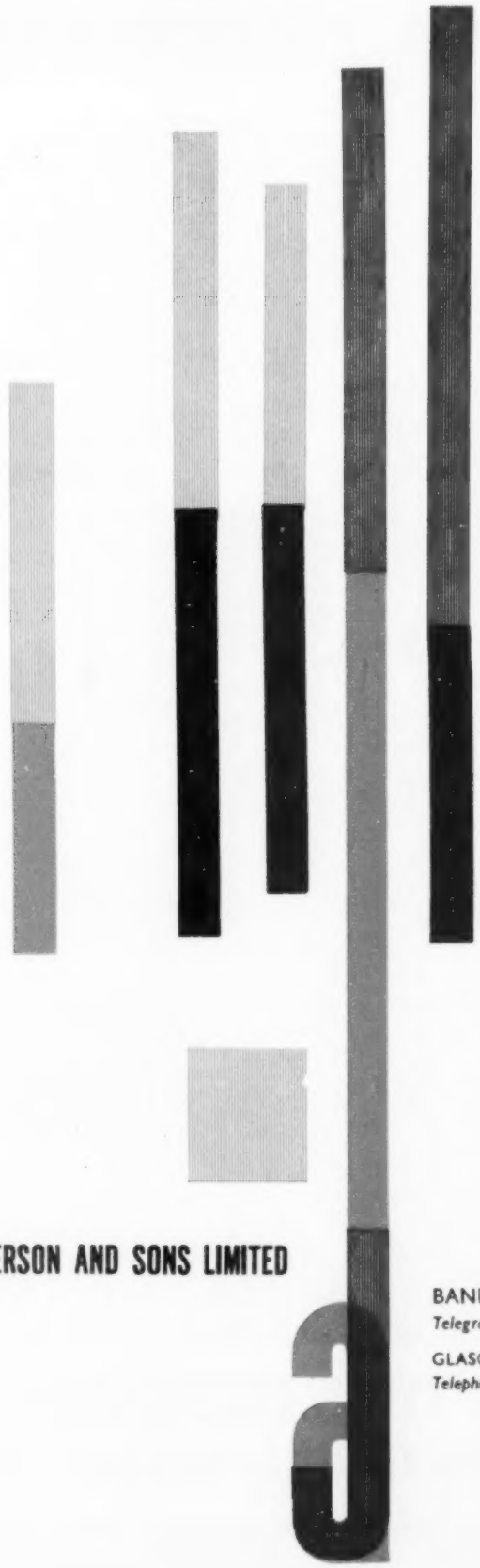
COLUMBIAN INTERNATIONAL (Great Britain) LTD

116 CANNON STREET, LONDON, E.C.4. Telephone MANsion House 5277 (PBE) Telegrams NOIRCEUR LONDON

Sole selling agents to the rubber industry for

PRICE'S (Bromborough) LTD Bromborough Pool, New Ferry, near Birkenhead

PB 67-9096-120



rubber reclaims

As a member of the B.R.R. group of companies our technical service is unsurpassed. We welcome enquiries concerning:

TYRE RECLAIM
RED TUBE RECLAIM
BLACK TUBE RECLAIM
DRAB RECLAIMS
MECHANICAL RECLAIM
RESIN RUBBER RECLAIM

JOSEPH ANDERSON AND SONS LIMITED

BANK STREET CLAYTON MANCHESTER 11
Telegrams : Sulphuring Manchester Telephone : East 0865

GLASGOW OFFICE 178 FULTON STREET GLASGOW W.3
Telephone : Scotstoun 2660 & 2661 Telegrams : Jagardi Glasgow

AUTOFLOW VAQUA PROCESS CABINET

RUBBER

MOULD

CLEANING

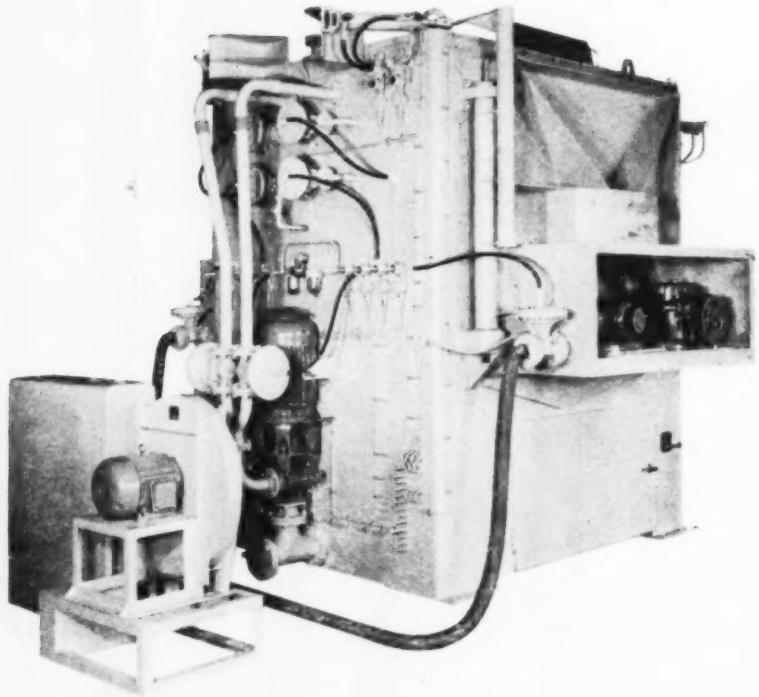
AND

POLISHING

WITHOUT

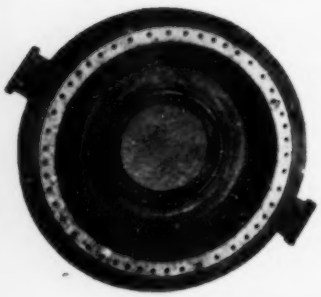
DIMENSIONAL

CHANGE



A FULLY AUTOMATIC UNIT
AS SUPPLIED TO THE DUNLOP GROUP OF COMPANIES

This process is superior to sand, shot, or dry blast methods.



BEFORE

AFTER

ABRASIVE DEVELOPMENTS LIMITED

(WORLD WIDE SERVICE FACILITIES)

HENLEY-IN-ARDEN · SOLIHULL · WARWICKSHIRE

TELEPHONE: HENLEY-IN-ARDEN 435-8 **TELEGRAMS: AUTOFLOW, HENLEY-IN-ARDEN**

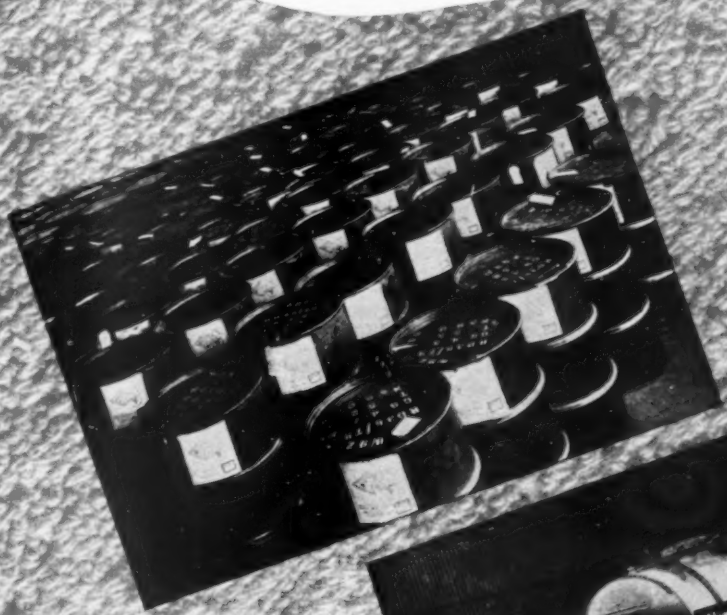
A FULL RANGE OF MANUAL MACHINES ALSO AVAILABLE

Sole Selling Agents in Great Britain, France and Denmark

COLUMBIAN INTERNATIONAL (GREAT BRITAIN) LIMITED . 116 CANNON STREET . LONDON . E.C.4
COLUMBIAN CARBON INTERNATIONAL (FRANCE) . 32 BOULEVARD HAUSSMANN . PARIS . 9e
COLUMBIAN CARBON INTERNATIONAL A.S . GL KALKBRAENDERIVEJ 11 . COPENHAGEN s

WITCO

LATEX
COMPOUNDS



FLOWING TO SERVE ALL THAT IS BEST IN
THE RUBBER AND TEXTILE INDUSTRIES

✳

THERE ARE DUCKS AND DUCKS

but the BEST Ducks come from . . .

STOTTS

STOTTS

are specialists in the manufacture of DUCKS from Cotton and Synthetic Yarns, for every purpose in the RUBBER INDUSTRY.

Conveyor Belting Ducks,
Hose Ducks,
Transmission Belting Ducks,
Chafer Ducks,
Packing Ducks.

JAMES STOTT LTD.

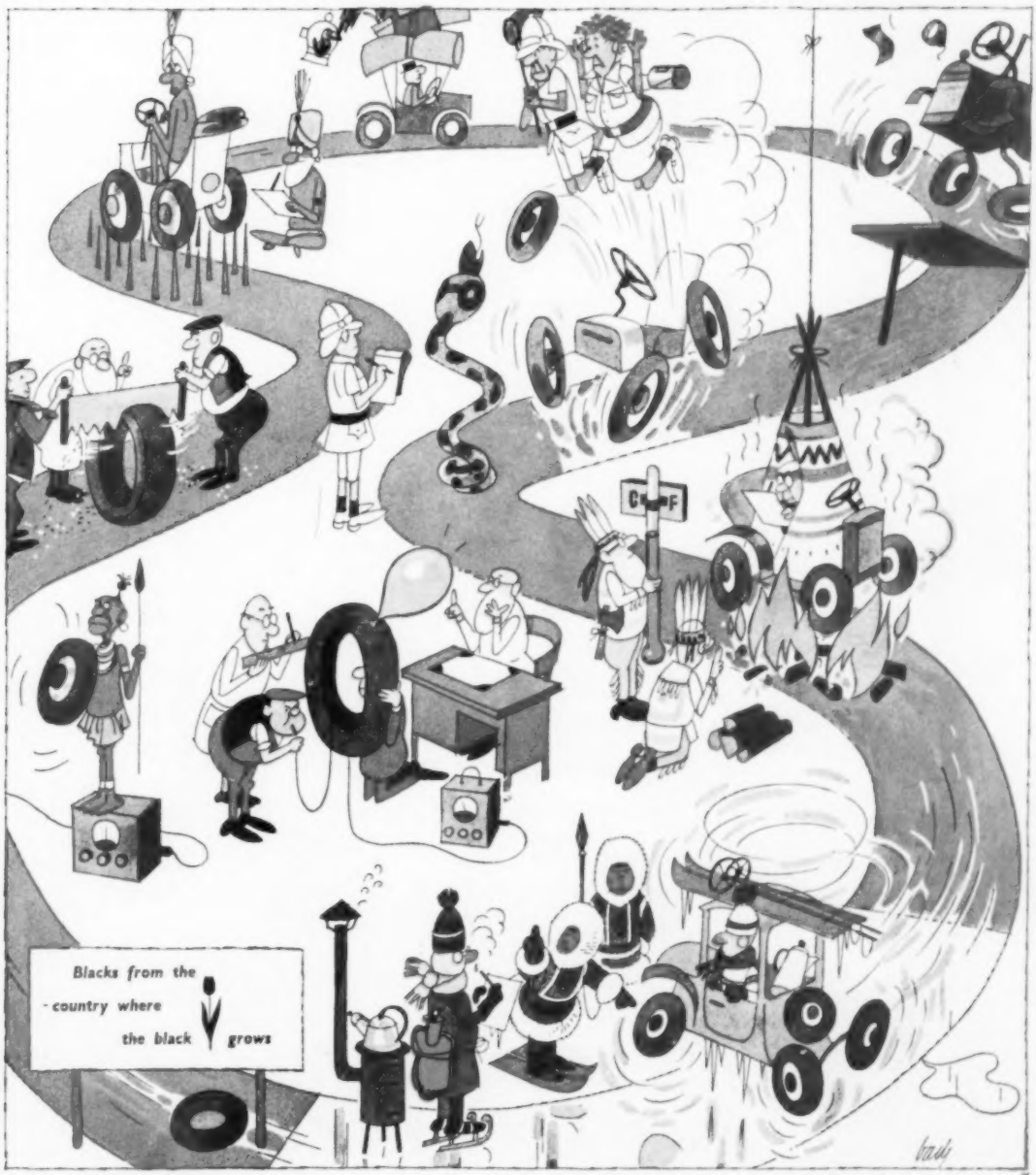
P.O. BOX 33. ROCHDALE.

Phone: ROCHDALE 49611 (3 lines)
Grams: "DOUBLER" ROCHDALE

✳

DUCK. ***Name of the largest group of birds of the order Anseres which includes Swans, Geese and Ducks.***

KETJEN CARBON's modern road-testing serves the rubber industry



Sales office:

NEDERLANDSCH VERKOOPKANTOOR VOOR CHEMISCHE PRODUCTEN N.V.

63, Mauritskade, Amsterdam - Holland - P.O.B. 4038 - Tel. 54322 - Telex: 12270 - Telegrams: Chemicals

Representative: Greyer, Brecheisen and Co. Ltd., Bush Lane House, Cannon Street, London, E.C.4. *Tel:* MANsion House 9030 & 2392. *Grams:* Oilanchems, London

KETJENBLACK ISAF · KETJENBLACK LHI · KETJENBLACK HAF · KETJENBLACK CR · KETJENBLACK FEF · KETJENBLACK FF · KETJENBLACK GPF · KETJENBLACK SRF

UNIVERSAL

RAW MATERIALS for the RUBBER INDUSTRY

OLEINES

Extra Pale, Pale and Brown

STEARINES

High qualities of low Iodine Value. Rubber grade and Commercial qualities in Flake, Block, Powder and Beads.

GLYCERINES

B.P. and Refined Technical grades.

DISTILLED FATTY ACIDS

Lauric Acid in all grades of purity. Distilled Fatty Acids for compounding and soapmaking.

SPECIAL RUBBER SOAPS

For lubrication and latex production.

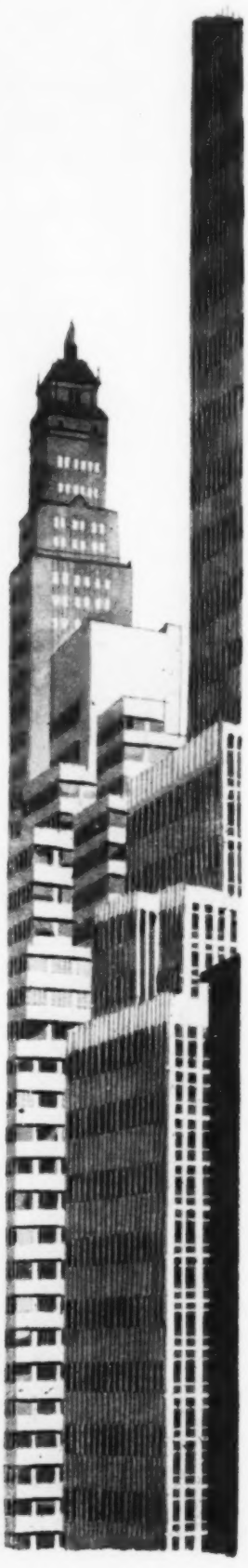
WRITE FOR TECHNICAL BROCHURE

SAMPLES AVAILABLE ON REQUEST

THE UNIVERSAL OIL COMPANY LIMITED

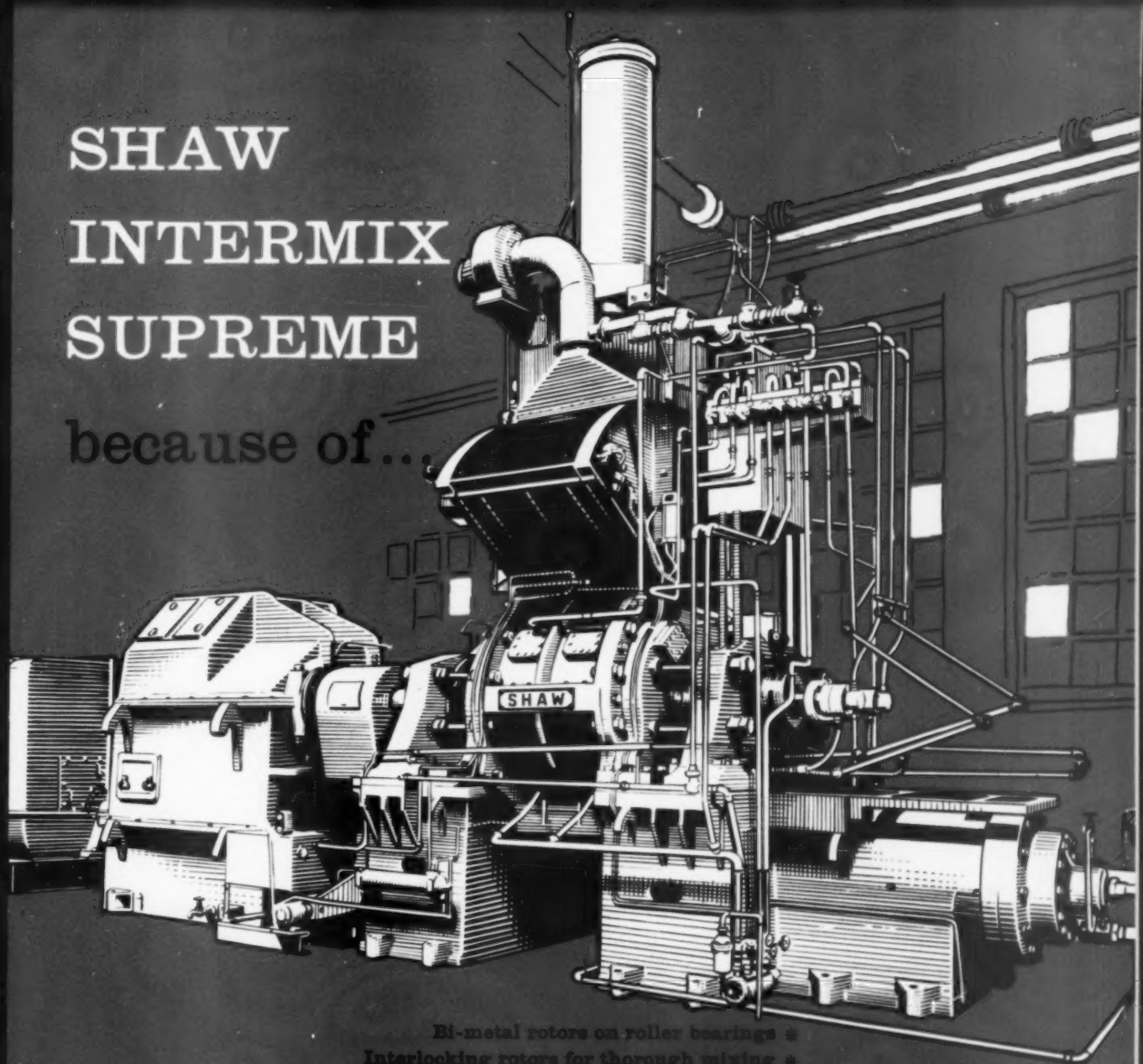
HULL Head Office and Works
Phone: 41311 (9 lines)
Telegrams and Cables "UNIVOL, HULL TELEX"

LONDON Cunard House,
88 Leadenhall Street, E.C.3
Phone: AVE 4081 (3 lines)
Telegrams "Premoil, LONDON TELEX"



SHAW INTERMIX SUPREME

because of...



Bi-metal rotors on roller bearings *
Interlocking rotors for thorough mixing *
Efficient temperature controls at all contact surfaces *
Easily replaceable wear plates *

The Shaw Intermix has proved in practice to be the supreme heavy duty internal mixer for compounding rubber and plastics, and a wide range of other materials, abrasive and non-abrasive

Francis Shaw

S

FRANCIS SHAW & COMPANY LIMITED
MANCHESTER 11 ENGLAND

Telegrams: "Calender" Manchester Telephone: East 1313 Telex: 66-357

London Office: 22 Great Smith Street London SW1 · Telephone: Abbey 3945 · Telegrams: Vibrate London · Telex: 22350

Canada: Francis Shaw (Canada) Ltd Grahams Lane Burlington Ontario · Tel: Nelson 4-2250 · Telegrams: Calender Burlington Ontario

OVERSEAS AGENTS THROUGHOUT THE WORLD

UNIVERSAL

RAW MATERIALS for the RUBBER INDUSTRY

OLEINES

Extra Pale, Pale and Brown

STEARINES

High qualities of low Iodine Value, Rubber grade and Commercial qualities in Flake, Block, Powder and Beads.

GLYCERINES

B.P. and Refined Technical grades.

DISTILLED FATTY ACIDS

Lauric Acid in all grades of purity. Distilled Fatty Acids for compounding and soapmaking.

SPECIAL RUBBER SOAPS

For lubrication and latex production.

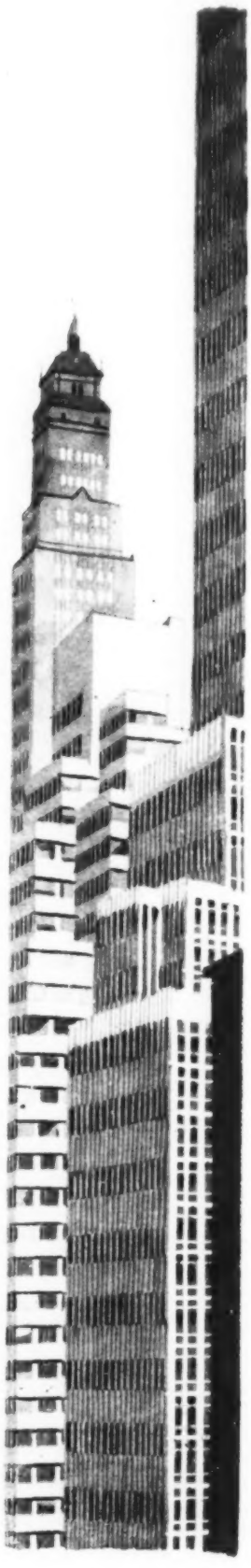
WRITE FOR TECHNICAL BROCHURE

SAMPLES AVAILABLE ON REQUEST

THE UNIVERSAL OIL COMPANY LIMITED

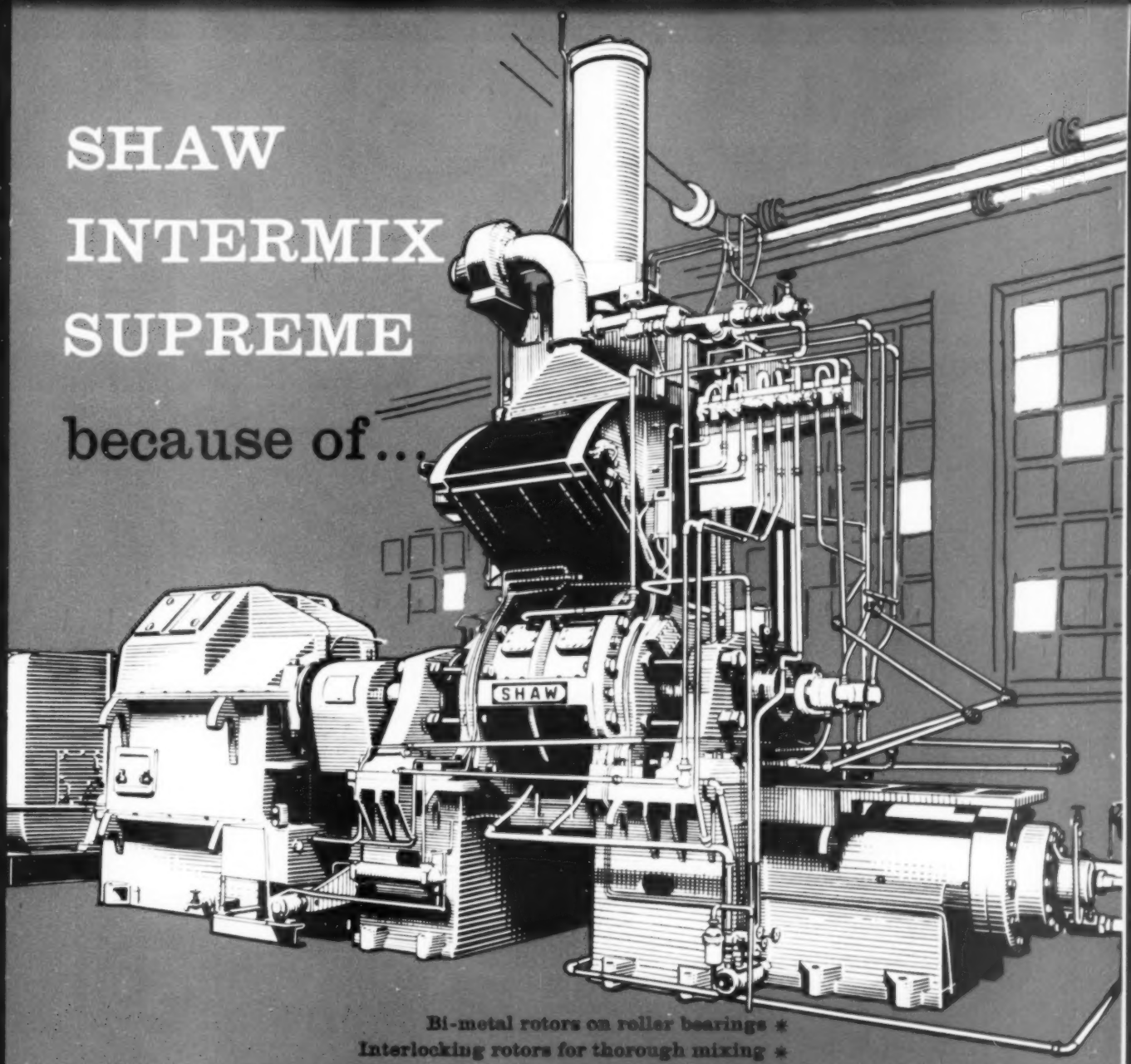
HULL Head Office and Works
Phone: 41311 (9 lines)
Telegrams and Cables "UNIVOL, HULL TELEX"

LONDON Cunard House,
88 Leadenhall Street, E.C.3
Phone: AVE 4081 (3 lines)
Telegrams "Premoil, LONDON TELEX"



SHAW INTERMIX SUPREME

because of...



Bi-metal rotors on roller bearings *
Interlocking rotors for thorough mixing *
Efficient temperature controls at all contact surfaces *
Easily replaceable wear plates *

The Shaw Intermix has proved in practice to be the supreme heavy duty internal mixer for compounding rubber and plastics, and a wide range of other materials, abrasive and non-abrasive

Francis Shaw

FRANCIS SHAW & COMPANY LIMITED
MANCHESTER 11 ENGLAND

Telegrams: "Calender" Manchester Telephone: East 1313 Telex: 66-357

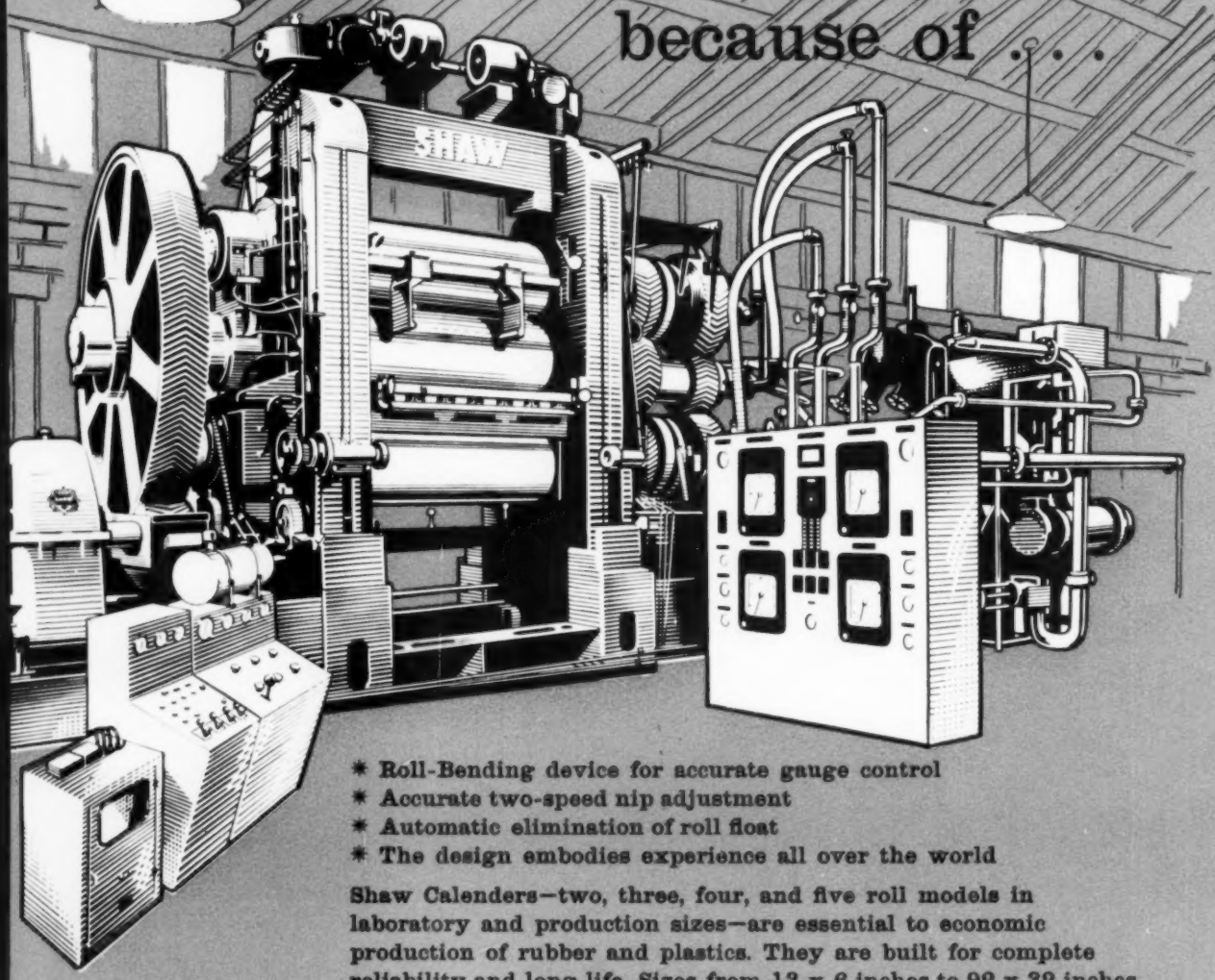
London Office: 22 Great Smith Street London SW1 · Telephone: Abbey 2345 · Telegrams: Vibrate London · Telex: 22260

Canada: Francis Shaw (Canada) Ltd Grahams Lane Burlington Ontario · Tel: Nelson 4-2260 · Telegrams: Calender Burlington Ontario

OVERSEAS AGENTS THROUGHOUT THE WORLD

SHAW CALENDERS SUPREME

because of . . .



* Roll-Bending device for accurate gauge control
* Accurate two-speed nip adjustment
* Automatic elimination of roll float
* The design embodies experience all over the world

Shaw Calenders—two, three, four, and five roll models in laboratory and production sizes—are essential to economic production of rubber and plastics. They are built for complete reliability and long life. Sizes from 13 x 6 inches to 92 x 32 inches.

Francis Shaw

FRANCIS SHAW & COMPANY LIMITED
MANCHESTER 11 ENGLAND

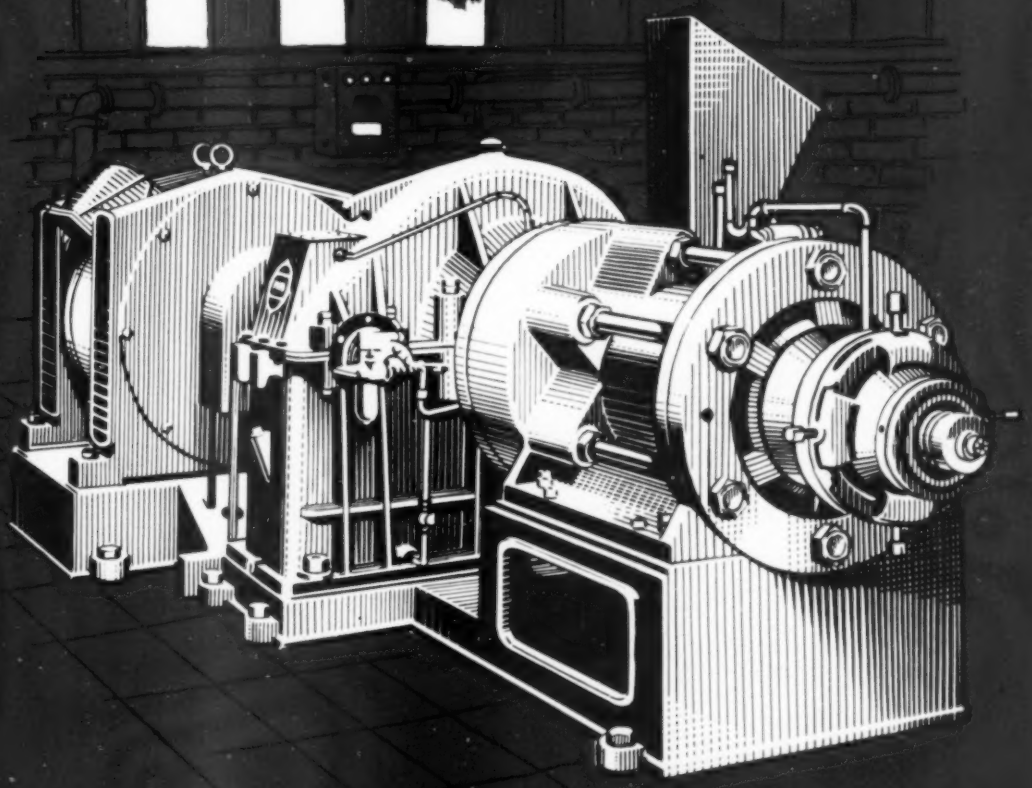
Telegrams: "Calendar" Manchester Telephone: East 1313 Telex: 66-357

London Office: 22 Great Smith Street London SW1 • Telephone: ABBey 3245 • Telegrams: Vibrate London • Telex: 22340
Canada: Francis Shaw (Canada) Ltd Grahams Lane Burlington Ontario • Tel: Nelson 4-2350 • Telegrams: Calender Burlington Ontario

OVERSEAS AGENTS THROUGHOUT THE WORLD

SHAW
RUBBER EXTRUDERS
SUPREME

because of . . .



- Rugged construction and simple power
- Highly efficient heating and cooling systems
- The design is backed by years of experience
- A fully equipped laboratory testing service

Shaw Rubber Extruders are built in sizes R1, R2, R3, R4½, R6, R8, R10 and R12 with screw diameters of 1", 2", 3", 4½", 6", 8" 10" and 12" respectively. They are designed for easy operation and maintenance, and for long trouble-free life.

Francis Shaw

S

FRANCIS SHAW & COMPANY LIMITED
MANCHESTER 11 ENGLAND

Telegrams: "Calender" Manchester Telephone: East 1313 Telex: 66-197

London Office: 20 Great [illegible] Street • London SW1 • Telephone: Abbey 3030 • Telegrams: Vitesse London • Telex: 22580
Canada: Francis Shaw (Canada) Ltd Orchard Line Burlington Ontario • Tel: Zenith 4-3150 • Telex: Calender Burlington Ontario

OVERSEAS AGENTS THROUGHOUT THE WORLD

SHAW PLASTIC EXTRUDERS SUPREME

because of . . .

* 20 years' experience in plastic extruder design
* A specification with latest techniques in temperature control and electric heating
* A very full range of screw, cylinder, and die-head designs
* A wide range of auxiliary equipment providing complete lay-outs

Francis Shaw Plastic Extruders, for all thermo-plastics, are built in sizes P1, P1½, P2, P3, P4½, P6, P8, and P12, with screw diameters 1″, 1½″, 2″, 3″, 4½″, 6″, 8″ and 12″ respectively.

Francis Shaw

S

FRANCIS SHAW & COMPANY LIMITED
MANCHESTER 11 ENGLAND

Telegrams: "Calender" Manchester Telephone: East 1313 Telex: 66-357

London Office: 22 Great Smith Street London SW1 · Telephone: ABBey 3245 · Telegrams: Vibrate London · Telex: 22250
Canada: Francis Shaw (Canada) Ltd Grahams Lane Burlington Ontario · Tel: Nelson 4-2350 · Grams: Calender Burlington Ontario

OVERSEAS AGENTS THROUGHOUT THE WORLD

P.8048

TITANIUM OXIDE

Where does quality control begin? At the start of the production process? At the arrival of the raw material at the plant? LAPORTE quality control originates with the raw materials at their source: samples of titanium-bearing black ilmenite sand are flown

LAPORTE

from various continents to the Laporte Research Laboratories to prove their worth. How far does quality control extend? As far as the despatch of the product? LAPORTE quality control follows the product into the customers' works throughout its application.

LAPORTE

L I L LAPORTE TITANIUM LTD. New Bond Street House, London, W.1. HYDe Park 0631

SHAW PLASTIC EXTRUDERS SUPREME

because of . . .

* 20 years' experience in plastic extruder design
* A specification with latest techniques in temperature control and electric heating
* A very full range of screw, cylinder, and die-head designs
* A wide range of auxiliary equipment providing complete lay-outs

Francis Shaw Plastic Extruders, for all thermo-plastics, are built in sizes P1, P1½, P2, P3, P4½, P6, P8, and P12, with screw diameters 1″, 1½″, 2″, 3″, 4½″, 6″, 8″ and 12″ respectively.

Francis Shaw

S

FRANCIS SHAW & COMPANY LIMITED
MANCHESTER 11 ENGLAND

Telegrams: "Calender" Manchester Telephone: East 1313 Telex: 66-357

London Office: 22 Great Smith Street London SW1 · Telephone: ABBey 3945 · Telegrams: Vibrate London · Telex: 22350
Canada: Francis Shaw (Canada) Ltd Grahams Lane Burlington Ontario · Tel: Nelson 4-2350 · Grams: Calender Burlington Ontario

OVERSEAS AGENTS THROUGHOUT THE WORLD

TITANIUM OXIDE
Where does quality control begin? At the start of the production process? At the arrival of the raw material at the plant? LAPORTE quality control originates with the raw materials at their source: samples of titanium-bearing black ilmenite sand are flown
LAPORTE
from various continents to the Laporte Research Laboratories to prove their worth. How far does quality control extend? As far as the despatch of the product? LAPORTE quality control follows the product into the customers' works throughout its application.
LAPORTE

LIL LAPORTE TITANIUM LTD. New Bond Street House, London, W.1. HYDe Park 0631

JMS

DESMODUR* R—for rubber to metal bonding and for self-curing cements.

DESMODUR* RF—similar to "Desmodur" R—but practically colourless.

VULKADUR* A—a synthetic resin with hardening and re-inforcing properties, primarily for copolymers of butadiene and acrylonitrile.

VULKADUR* T—auxiliary to improve rubber to fabric adhesion.

VULCANISING AGENT CDO 50—a curing agent for butyl rubber.

ANTIOXIDANT DDA—anti-flex cracking, low discolouration.

ANTIOXIDANT MB—non-discolouring—in compounds containing ultra-accelerators.

ANTIOXIDANT 4010 } Anti-flex cracking agent giving outstanding resistance to surface cracking caused by flexing, weathering and ozone.

ANTIOXIDANT 4010 NA } Similar to 4010 but increased protection can be achieved due to better solubility in rubber.

ANTIOXIDANT ZKF—for use in white or transparent vulcanisates—no discolouration.

ANTIOXIDANT PAN—phenyl alpha naphthylamine.

PERBUNAN* C—chloroprene rubber, available also as latex.

PERBUNAN* N—butadiene—acrylonitrile rubber, available also as latex.

SILCAFILL* C—a white, silica based reinforcing filler for natural and synthetic rubber.

Write Dept. N/4 for full details.

* *Registered Trade Mark*

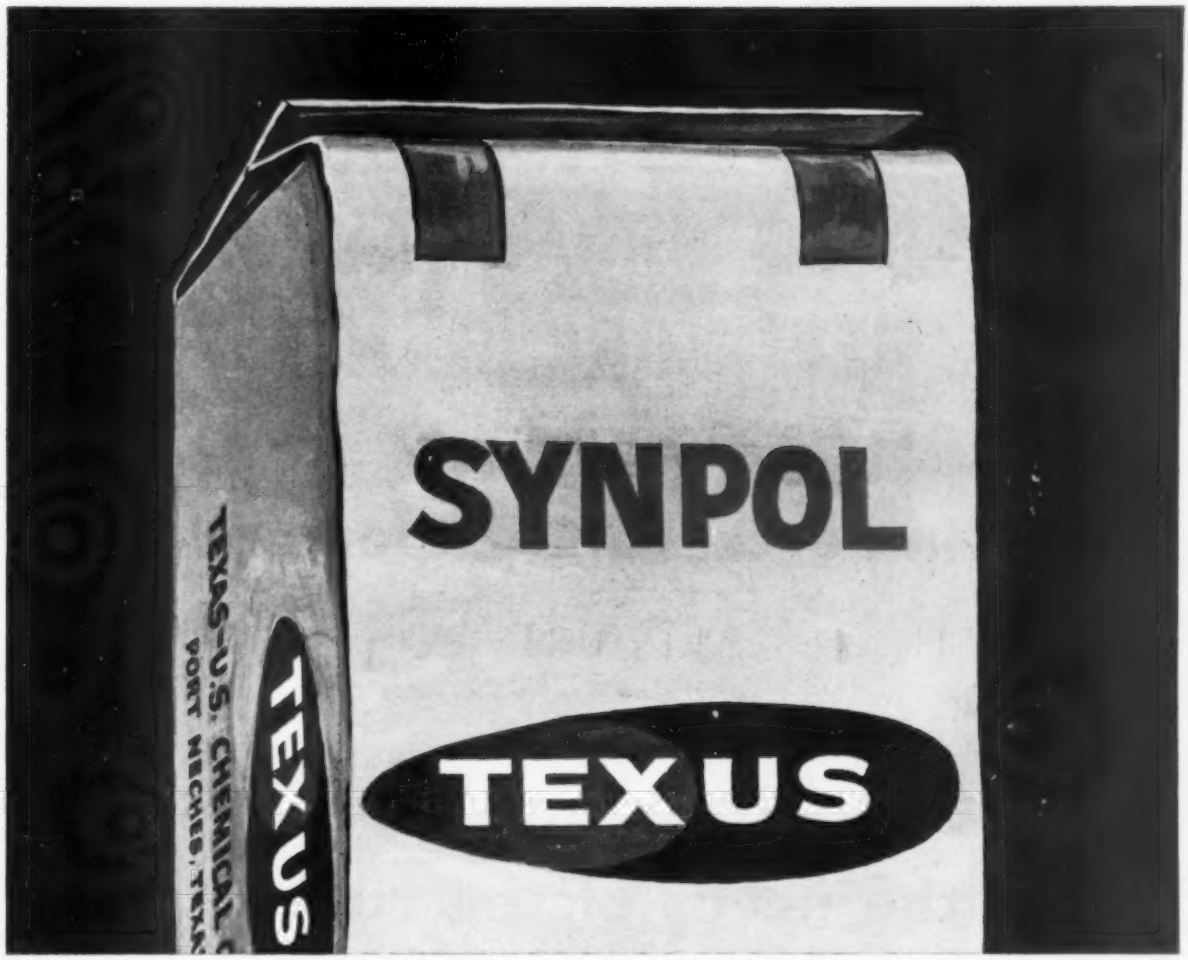
JMS

J. M. STEEL & CO. LTD.

36-38 KINGSWAY, LONDON, W.C.2 Tel. HOLborn 2532/5

Branch Offices :

73/79 KING ST., MANCHESTER 2.	**Tel. Deansgate 6077/9**
45 NEWHALL ST., BIRMINGHAM 3.	**Tel. Central 6342/3**
144 ST. VINCENT ST., GLASGOW C.2.	**Tel. Central 3262**



Two words that say "the right SBR"

Specify one of the more than 30 SYNPOL polymers and you've taken the most important step towards producing high quality synthetic rubber products. Every SYNPOL polymer is designed for a specific application area but is versatile enough to be used in many areas. And SYNPOL polymers are backed by Texus's outstanding technical staff . . . a staff that includes scientists with over 20 years of experience in the synthetic rubber industry. For practical information on how to get the best results with SYNPOL SBR polymers, contact your SYNPOL agent.

TEXUS

TEXAS-U.S. CHEMICAL COMPANY

9 Rockefeller Plaza, New York 20, New York

GREAT BRITAIN: CHAS. PAGE & CO., LTD., LONDON

SYNPOL AGENTS COVER THE WORLD

Argentina: P. Monier S.A.I.C., Buenos Aires. **Australia:** Ametex Australia Pty. Ltd., Sydney, N.S.W. **Austria:** August Mayer, Vienna. **Belgium:** W. A. Bekaert, Groot-Bijgaarden. **Brazil:** "Brasimet" Commercio e Industria, Sao Paulo and Rio de Janeiro. **Canada:** H. L. Blachford Ltd., Montreal, P.Q., and Toronto, Ont. **Chile:** Sali Hochchild S.A., Santiago de Chile. **Denmark:** Knud Arum, Copenhagen. **France:** Electrochimie D'Ugine, Paris. **Germany:** Arnold Otto Meyer, Hamburg. **Greece:** G. N. Kallivroussis, Athens. **India:** T. Smith Private Ltd., Bombay; Rostron and Co. Private Ltd., Calcutta. **Italy:** G.A.R.T., Turin. **Japan:** Chori Company Ltd., Osaka and Tokyo. **Mexico:** Als S.A., Mexico City. **Netherlands:** N.V. Transmare Handelmaatschappij, Rotterdam. **New Zealand:** A. M. Satterthwaite, Christchurch. **Norway:** Ingolf Wesenberg, Oslo. **Portugal:** Indomer Ltda., Oporto. **Spain:** Commercial Minera S.A., Madrid. **Sweden:** Kemi-Intressen AB., Stockholm. **Switzerland:** A. H. Meyer and Cie., Zurich. **Taiwan:** W.U. Wei Trading Co., Taipei. **Turkey:** Motor Limited, Sirketi, Istanbul. **Uruguay:** Faustino Beltran and Cie., Montevideo.

H. A. ASTLETT & CO. INC.
39 BROADWAY
NEW YORK 6, N.Y.

Cable Address: Astlett, New York

Importers and Exporters

Specializing in supplying the needs of the rubber industry

Exclusive Export Representatives of:

SID RICHARDSON CARBON COMPANY
FORT WORTH, TEXAS

MIDWEST RUBBER RECLAIMING COMPANY
EAST ST. LOUIS, ILLINOIS

AKRON STANDARD MOLD COMPANY
AKRON, OHIO

And other U.S. Manufacturers serving the Rubber and Plastics Industries

...double capacity

50,000,000 pounds added

Our new oil furnace black plant is now in production at Big Spring, Texas. This plant is designed to produce in excess of fifty million pounds of **HAF** and **ISAF** blacks per year, and of either high or low modulus types.

The very latest engineering and technical advancements available, from complete instrumentation to an entirely new type of furnace, are included in this plant's features, thus assuring our customers a continuity of uniform top quality product.

Our channel black plant at Odessa, Texas, will continue to produce both **TEXAS EPC** and **MPC**, plus special grades for the ink, paint, and plastic industries.

TEXAS
CARBON BLACKS

Sid Richardson
CARBON CO.
FORT WORTH, TEXAS

GENERAL SALES OFFICES
EVANS BUILDING
AKRON 8, OHIO

ELIMINATE POROSITY IN RUBBER

WITH Caloxol C

Investigations by the Rubber & Plastics Research Association of Great Britain, Shawbury have shown that moisture is, in many cases, the main cause of porosity occurring during rubber processing. To inhibit this porosity Sturge, in conjunction with the Research Association, developed Caloxol. Caloxol C31 is a 3:1 dispersion of high-grade calcium oxide in mineral oil and acts as a powerful dessicant to eliminate porosity due to moisture in both natural and synthetic rubber. It is particularly recommended for use in the following applications:

- Atmospheric cure of extrusions as in the fluidised bed technique
- Open curing
- In situ cure
- Orthodox mouldings where moisture is a problem

Caloxol is readily dispersible, non-scorching and stable on storage. Available in 50 kg non-returnable steel drums.

Samples, literature and prices obtainable on request from:

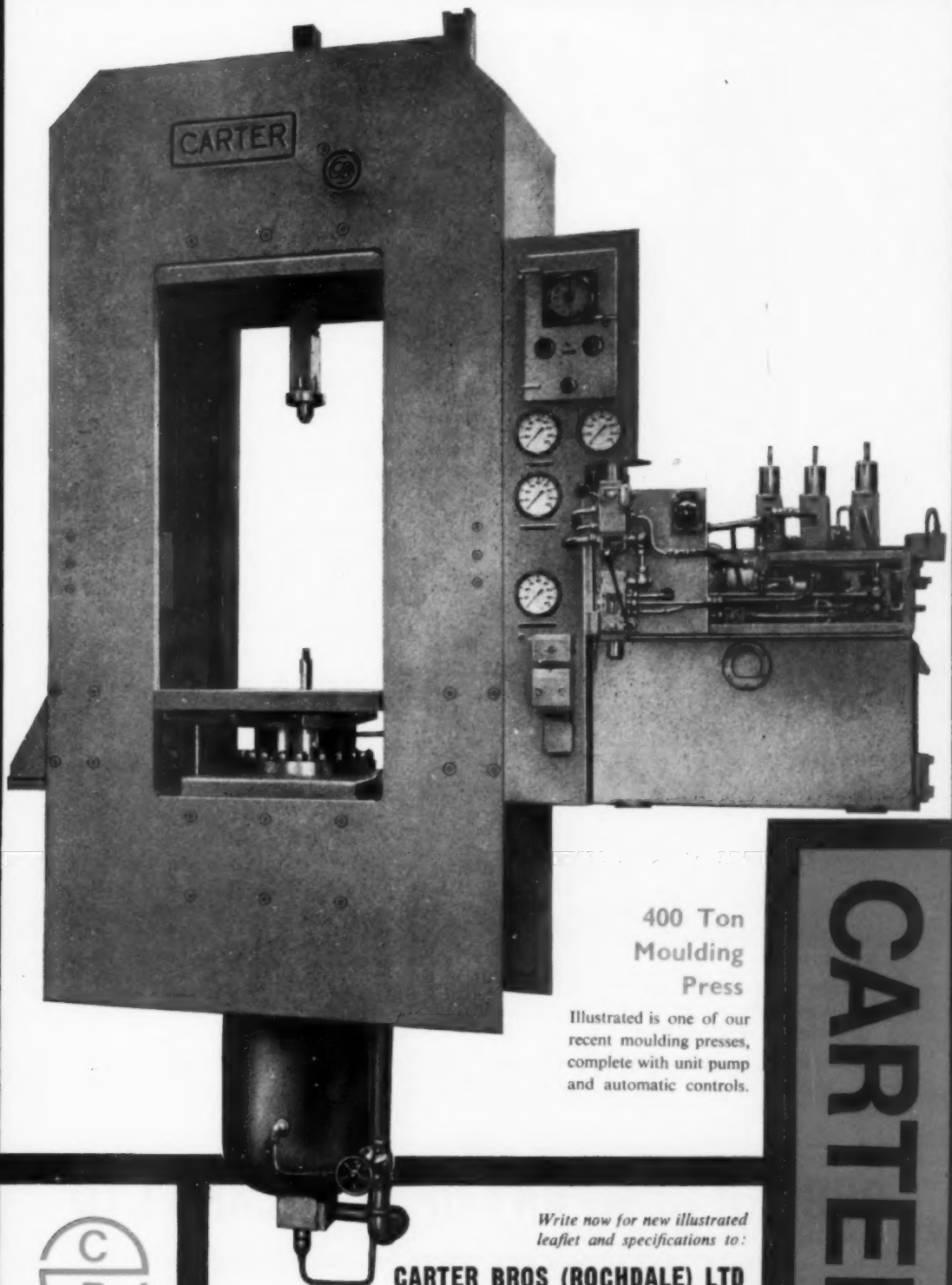
JOHN & E. STURGE LIMITED

WHEELEYS ROAD · BIRMINGHAM 15 · TELEPHONE: MIDLAND 1236

An independent company manufacturing fine chemicals since 1823

STURGE CHEMICALS

TGA G31



CARTER

400 Ton Moulding Press

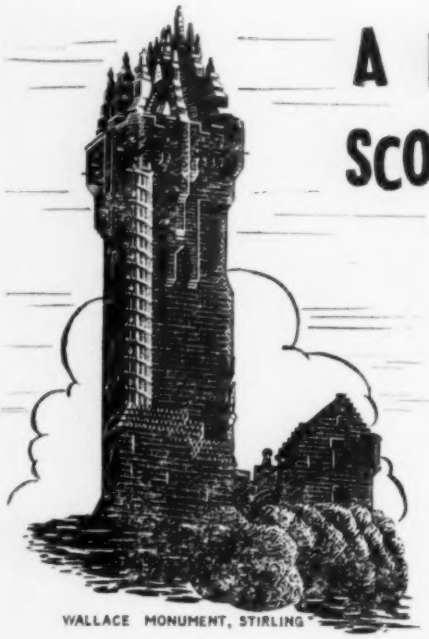
Illustrated is one of our recent moulding presses, complete with unit pump and automatic controls.

C B

Write now for new illustrated leaflet and specifications to:

CARTER BROS (ROCHDALE) LTD

Mellor Street, Rochdale, Lancashire. Tel.: 4431/2



WALLACE MONUMENT, STIRLING

A MONUMENT TO SCOTTISH TRADITION

ALL OUR PRODUCTS ARE A MONUMENT TO SCOTLAND'S LONG TRADITION IN INDUSTRY

In our fully equipped works, we specialise in the manufacture of:

- **INDIA RUBBER GOODS**
  for Shipbuilding, Engineering and Public Works Contractors
- **ALL GRADES OF CANVAS AND RUBBER BELTING**
  (Conveyor and Power Transmission)
- **RUBBER SHEET, WASHERS, RINGS**
  INSERTION CLOTH
  GLOVES for Industrial Purposes
  MATS AND MATTING, also MOULDED ARTICLES

CONTRACTORS TO THE BRITISH GOVERNMENT

Idéalement outillés, nos ateliers se spécialisent dans les articles suivants:

Matériel imperméabilisé au caoutchouc, pour les machines, les constructions maritimes, les chemins de fer et les Travaux Publics.

Toutes catégories de toiles et de courroies (courroies de transmission et ceintures convoyeuses)

Feuilles en caoutchouc, rondelles, anneaux, joints, gants spéciaux pour l'industrie, nattes et paillassonnages, moulages.

Fournisseurs du gouvernement anglais, etc.

En nuestros plenamente equipados talleres, nos especializamos en la fabricación de:

Géneros de Caucho para Ingenieria, Construcción de Barcos, Ferrocarriles y Contratistas de Trabajos Publicos.

Toda clase de Correas de Lona y Caucho (Transportadoras y Transmisoras de Energia).

Lámina de Caucho, Arandelas, Anillos, Tela de Inserción, Guantes para Fines Industriales, Felpudos y Alfombras, y también Articulos Moldeados.

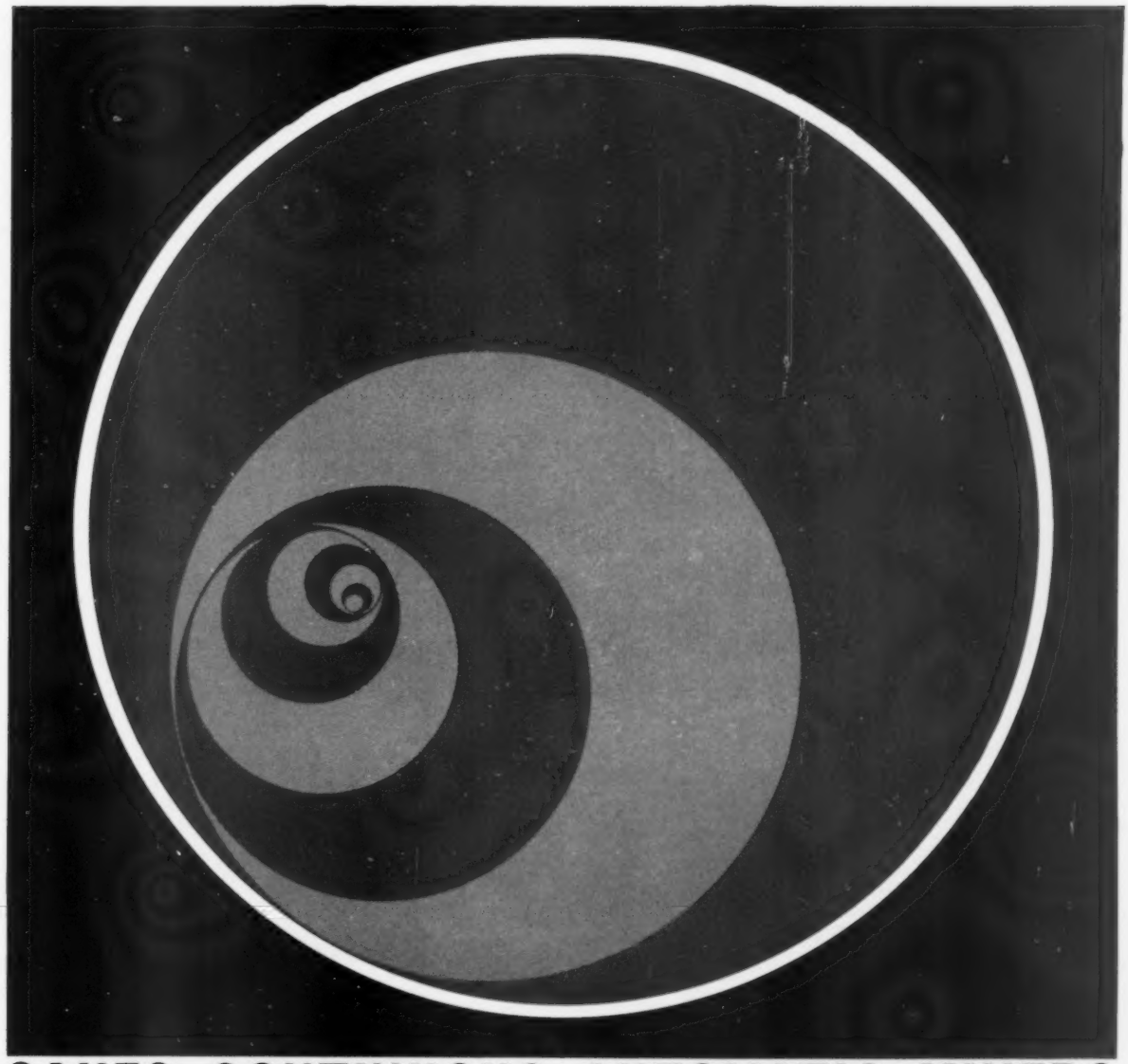
Contratistas para el Gobierno británico, etc.

THE RUBBER COMPANY OF SCOTLAND LTD

FORTHVALE WORKS, STIRLING, SCOTLAND

Telephone: Stirling 4285 (3 lines)

Telegraphic Address: "Forthvale Stirling"



OAKES CONTINUOUS AUTOMATIC MIXERS for foam rubber production

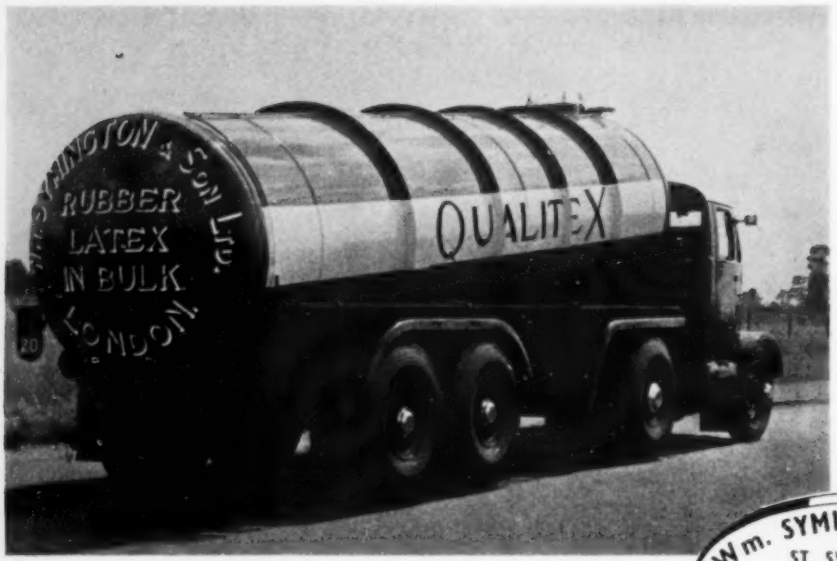
Proved by experience and specified by the majority of manufacturers of foam rubber used in the coating of floor fabrics, and the manufacture of carpet backing; underlay; moulded goods, etc.

Write for Bulletin 104 and for visit of technical representative.

E. T. OAKES LTD

Queens Avenue, Macclesfield, Cheshire
Telephone: Macclesfield 5362/3

QUALITEX



For all industrial applications.

Pour tous usages industriels.

Für alle industriellen Anwendungen.

Для всех промышленных применений.

Para todos lisos industriales.

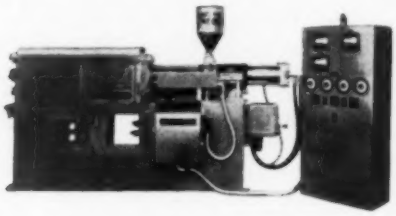
För alla industriella Ändamal.

Per tutte le applicazioni industriali.

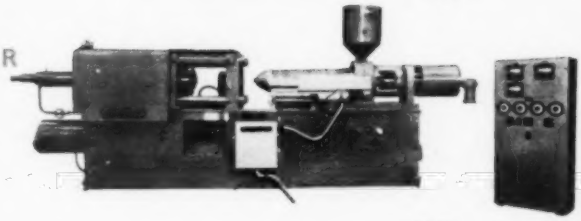
Wm. SYMINGTON & SON, LIMITED

ST. SWITHIN'S HOUSE, WALBROOK, LONDON, E.C.4, ENGLAND

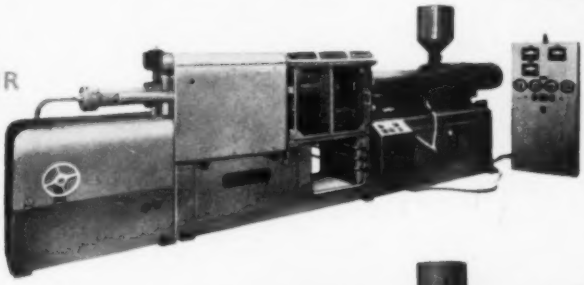
21MR



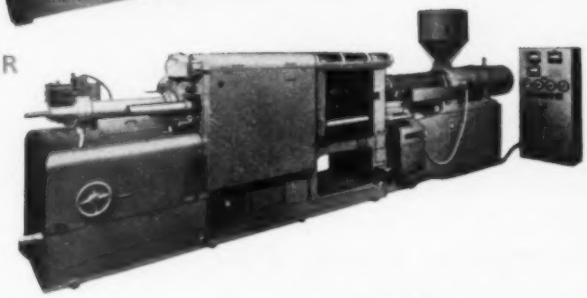
30MR



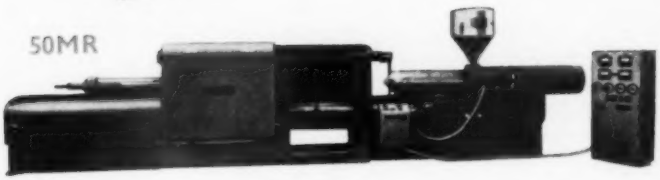
35MR



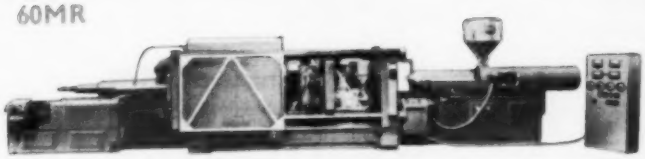
40MR



50MR



60MR



PECO

'ROTOTHRUST'

INJECTION MOULDING MACHINES

with

SCREW PRE-PLASTICISER

The completely new Rotothrust range as exhibited on the Continent and in the U.K. Phone for full specifications today—they will be on your desk tomorrow.

21 MR
Vol. Moulded per Shot: 6-8.25 in³
Mould Locking Force: 80 tons

30 MR
Vol. Moulded per Shot: 17-33.5 in³
Mould Locking Force: 150 tons

35 MR
Vol. Moulded per Shot: 17-33.5 in³
Mould Locking Force: 275 tons

40 MR
Vol. Moulded per Shot: 33.5-56 in³
Mould Locking Force: 300 tons

50 MR
Vol. Moulded per Shot: 87-112 in³
Mould Locking Force: 500 tons

60 MR
Vol. Moulded per Shot: 159-330 in³
Mould Locking Force: 750 tons

****Screws available with varying pressures to suit different mounting requirements.*

PECO PRODUCTS

PECO MACHINERY SALES (Westminster) LTD

88 Victoria Street, London, S.W.1. Sales: ABBey 1793 Service: MACaulay 1212
Telegrams: Pecomatic London Telex: 2-3312

. . . show 'em a price from Phoenix!

Imagine it. Management meeting. General Manager speaking. "Referring to our last meeting, it looks as though we must very reluctantly turn down the enquiry from Willards. Their cost ceiling is rather low . . ." *Here's your chance! A slight clearing of the throat to attract attention, then speak.* "Err-mmm. Excuse me if I interrupt, Mr. Matthews. Since our last meeting, I have followed up a lead, and I am now very happy to inform you that I have a price for the rubber compound which will allow us our usual profit margin on the components, and still keep us below Willard's ceiling." *Ah! that's got 'em. Old Matthews doesn't seem to believe it . . . pass him the quotation. That know-all Skinner looks really put-out. Chairman's nodding the way he always does when he's pleased. Tell them the rest.* "Firm called Phoenix Rubber Co. Ltd. Seem to be an—er—elastic sort of organisation. Geared to handle the special mixes we want at an economic cost. Yes, Mr. Matthews, I'll have the representative call tomorrow. Thank you sir."

Maybe that's not quite the way your meetings go. But it will still pay you to get in touch with Phoenix — first!

PHOENIX

NATURAL & SYNTHETIC RUBBER COMPOUNDS

Phoenix Rubber Co. Ltd., Slough, Buckinghamshire. **Telephone: Slough 22307/9**

MARBON 8000A

HIGH STYRENE RESIN

MARBON 8000A is a reinforcing resin with a lower flux temperature and superior processing properties. It gives fast mixing cycles, smooth extrusions, easy calendering and improved mould flow. It imparts excellent hot tear strength, hardness and stiffness in abrasion and flex resistant compounds. Clean bright colours and uniform cell structures are obtained by its use.

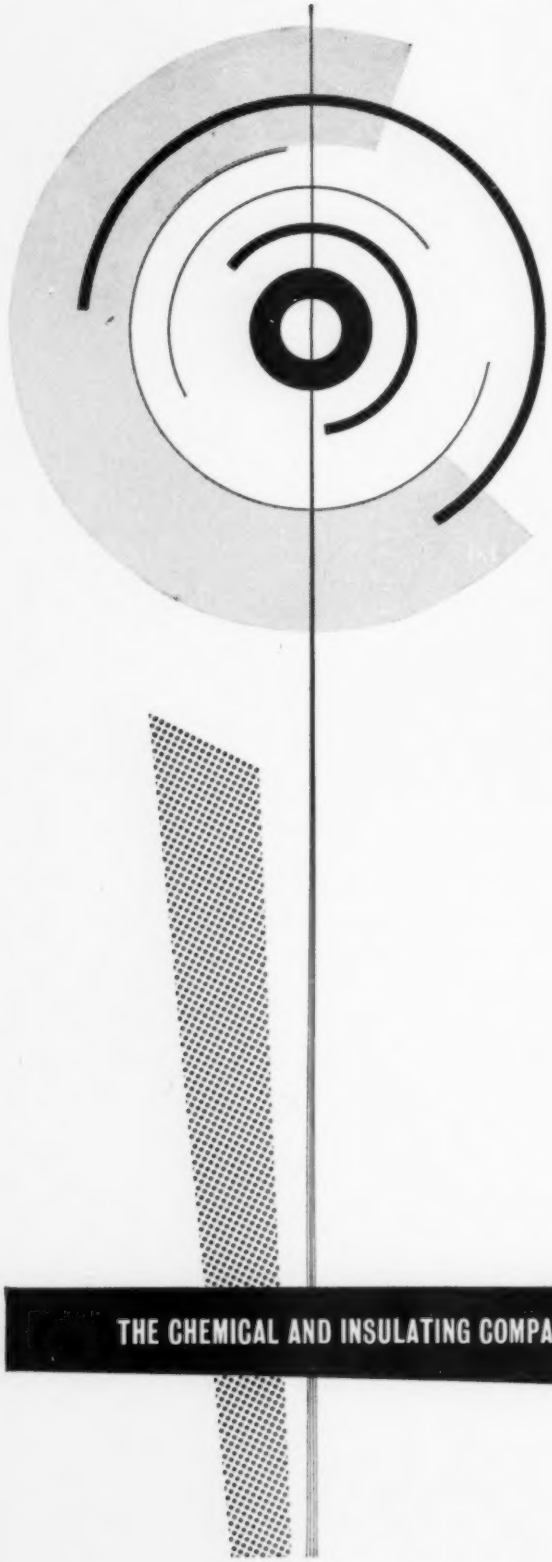
MARBON 8000A is recommended for use in natural rubber, SBR, nitrile rubber and neoprene and is particularly useful for DV footwear, soles and heels, floor tiles, mechanical goods, hard rubber, wire and cable applications.

Write for Anchor Bulletin 144/R/59

MARBON 8000 is a registered trademark
Distributors for the Marbon Chemical Division of Borg Warner Corporation

ANCHOR CHEMICAL COMPANY LTD · MANCHESTER 11

Offices at London, Glasgow, New York. Agents in all principal countries.



for Rubber Compounding there's nothing to equal DARLINGTON MAGNESIUM OXIDES....

Darlington Magnesium Oxides are available in various grades of reactivity for different compounding needs.

The high reactive grade is especially suitable for Neoprene compounding, since it protects the materials against scorching during mixing and ensures a fairly rapid curing rate during vulcanisation. For S.B.R. compounds the normal reactive grade is particularly well adapted, acting as an activator of the accelerator added to the rubber stock.

Write for full details of Darlington Magnesia Chemicals for the rubber and plastics industries to:

THE CHEMICAL AND INSULATING COMPANY LIMITED Darlington, Co. Durham

The Chemical and Insulating Co. Ltd., Darlington, Co. Durham
A MEMBER OF THE DARLINGTON CHEMICALS LTD. GROUP OF COMPANIES
U.K. Selling Agents: Clifford Christopherson & Sons Ltd.
1 Knightsbridge Green, London, S.W.1

THE RUBBER ESTATE AGENCY LTD.

and its wholly owned Subsidiary

53 EASTCHEAP, LONDON, E.C.3

Secretaries, Registrars and Commercial Agents for:

BATU KAWAN RUBBER & COCONUT PLANTATIONS LTD.
BANDAR SUMATRA RUBBER CO. LTD.
BOEKIT MAS DEVELOPMENT CO. LTD.
BUNTAR RUBBER ESTATES LTD.
EASTERN SUMATRA RUBBER ESTATES LTD.
JAVA RUBBER PLANTATIONS LTD.
JERAM RUBBER ESTATES LTD.
KADIENLENA TEA ESTATE LTD.
KEPITIGALLA RUBBER ESTATES LTD.
KUALA LUMPUR-KEPONG AMALGAMATED LTD.
LANGKAT SUMATRA RUBBER CO. LTD.
NCHIMA TEA & TUNG ESTATES LTD.
SOEMBER AJOE RUBBER ESTATES LTD.
SUNGEI KAHANG RUBBER CO. LTD.
TAMBIRA RUBBER ESTATES LTD.
TAMIANG RUBBER ESTATES LTD.
TANJONG MALIM RUBBER CO. LTD.

Secretaries and Registrars for:

ANGLO-SUMATRA ESTATES AGENCY LTD.
SENNAH RUBBER CO. LTD.
RUBBER ESTATE AGENCY INVESTMENTS LTD.
AMALGAMATED RUBBER AND INDUSTRIAL PRODUCTS LTD.
BASIC RUBBER PRODUCTS LTD.
EXPRESS TYRE SERVICE (LONDON) LTD.
OVERSEAS SUPERMILK CO. LTD.
REPETITION TYRE & ACCESSORIES LTD.
VALOX RUBBER PRODUCTS LTD.

Registrars for:

CROWDEN & KEEVES LTD.
DAVIS & TIMMINS LTD.
LUBOK INVESTMENTS LTD.
MITRE TRUST LTD.
PILLAR HOLDINGS LTD.
P.I.T. SECURITIES LTD.
PREFERENTIAL INVESTMENT TRUST LTD.
REMFIELD TRUST LTD.
SEMPAH HOLDINGS LTD.

ANGLO-SUMATRA ESTATES AGENCY LTD.

(in association with Societe Internationale de Plantations et de Finance).

S.I.P.E.F./Anglo-Sumatra, MEDAN, SUMATRA

Agents for:

BANDAR SUMATRA RUBBER CO. LTD.
BOEKIT MAS DEVELOPMENT CO. LTD.
EASTERN SUMATRA RUBBER ESTATES LTD.
LANGKAT SUMATRA RUBBER CO. LTD.
TAMBIRA RUBBER ESTATES LTD.
TAMIANG RUBBER ESTATES LTD.
S.A. DES PLANTATIONS DE TELOK DALAM.
N.V. TOLAN TIGA EXPLOITATIE MIJ.

Shipping Agents for:

BARBER-FERN-VILLE LINES
PENINSULA & ORIENT STEAM NAVIGATION CO.
POLISH OCEAN LINES

Insurance Agents for:

BLOM & VAN DER AA
LIVERPOOL & LONDON & GLOBE INSURANCE CO. LTD.

Stable companions

For P.V.C. stability, take the capable company of lead compounds. They are hydrochloric acid acceptors, yield a chloride low in water solubility, are insoluble in common solvents. They inhibit unsaturation development, screen ultra-violet light, inhibit oxidation *and* what's more, cost relatively little.

Take NOVADEL Lead Compounds. Available as dry powders, damped with 3% plasticiser, or as pastes. They're compounded too, out of progressive experience, research enterprise and downright efficient service.

*

Then there's Estabex .. 2307, 2310, 2311, 2375. BC158 and Z20 .. for the applications in which lead compounds are unsuitable.

Our leaflets give all the basic information. Properties, predispersion ratios, specifications, analyses and packings on seven lead compounds, and similar data on six types of Estabex. Any further details or advice you may require, will be gladly given.

* *2307 Epoxidised Vegetable Oil*
2310: Epoxy Oil
2311: Epoxy Oil
2375: Epoxy Ester
BC158 Barium Cadmium Laurate
Z20: Zinc Octoate

NOVADEL

STABILISERS for P.V.C.

NOVADEL LIMITED, ST. ANN'S CRESCENT, LONDON SW18 VANDYKE 7761
WORKS: GILLINGHAM, KENT

60808

C. W. RUBBER EXPORTS LTD.

THE QUARRY, QUARRY STREET
WOOLTON, LIVERPOOL, 25

Telephone: Gateacre 2091 & 1779 *Telegrams: Caucho Liverpool*

WASTE RUBBER IMPORTERS

WASTE RUBBER EXPORTERS

- Collecting regularly from factories in the United Kingdom under long term contracts.
- Specialising in the dissection of all types of tyres.
- Dealing in all grades of waste rubber to and from all parts of the world.

LATEX

ACCUMULATORS · HYDRAULIC BALING PRESSES
BLANKING CALENDERS · BALE CUTTING
MACHINES · BELT MAKING MACHINES
CALENDERS · COATING MACHINES · CRACKER
MILLS · CREPERS · CHALK BRUSHING
MACHINES · DRY HEAT STOVES · DOUBLING
MACHINES · EXTRUDERS · FORCING
MACHINES · GRAMOPHONE RECORD PRESSES

LATEX

ENGINEERING COMPANY

proprietors: Plastics and Rubber Machinery Limited

Victoria Street · Droylsden · Manchester
Telephone: Droylsden 1251 **Telegrams: Washer, Droylsden**

London Office · 4 Clements Inn · W.C.2
Telephone: Chancery 2401/2 **Telegrams: Plastrub, Estrand, London**

HOSE MAKING MACHINES · INTERNAL MIXERS
LAMINATING PRESSES · MILLS · MOULDING
PRESSES · PUMPS · VERTICAL RAM LOW SPEED
PLANTATION MACHINERY · ROLL MIXERS
SPECIAL MACHINERY · STRAINERS · SPREADING
MACHINES · TYRE MAKING MACHINERY · TUBE
MAKING MACHINERY · VULCANISING PRESSES
WASHING MACHINES

ALKALI RECLAIMED RUBBER

AERIAL VIEW OF PART OF THE LIMOGES FACTORY

WATTELEZ

HEAD OFFICE AND WORKS:

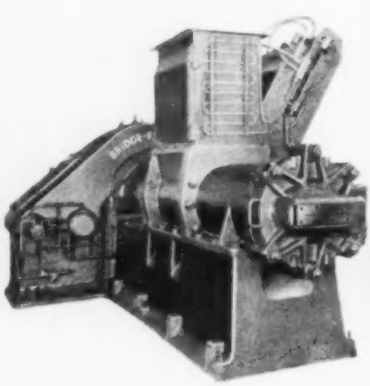
COLOMBES SEINE FRANCE

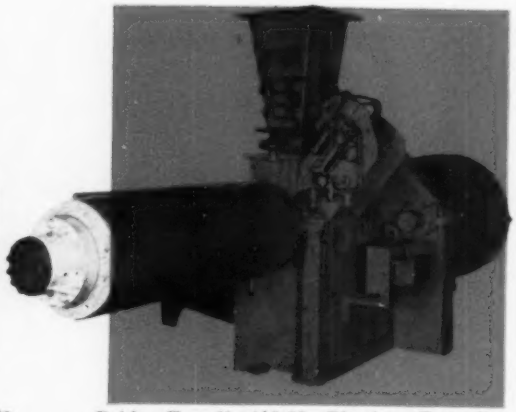
AND LIMOGES FRANCE

BRIDGE

Makers of some of the

Bridge Extruders are an essential link in the chain of continuous expanding production. Being fully automatic with speeds to match the mixing cycle times of the Banbury Mixer, they require no operators, occupy smaller floor space, improve manufacturing efficiency and reduce handling costs.

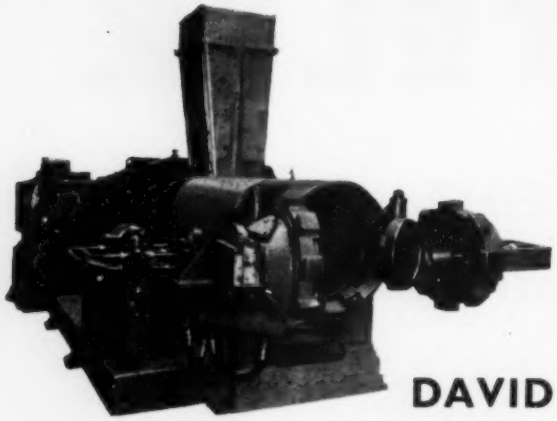




Bridge-Farrell 4½" 8" Plastics Extruding Machine which receives plastics polyethylene stock from the Banbury Mixer and extrudes the material in the form of a strip.

The Plastics Extruder shown above has been specially designed to receive and extrude the batch from the Banbury Mixer under ideal fully controlled thermal conditions and continuously produce strip or rod form from Banbury Mixer cycles as low as two minutes. Such combinations of machines have been designed and developed for various types of plastics and rubber and are the result of a vast background of experience and factory performance in modern methods of manufacture.

. . . acclaimed as the ultimate in



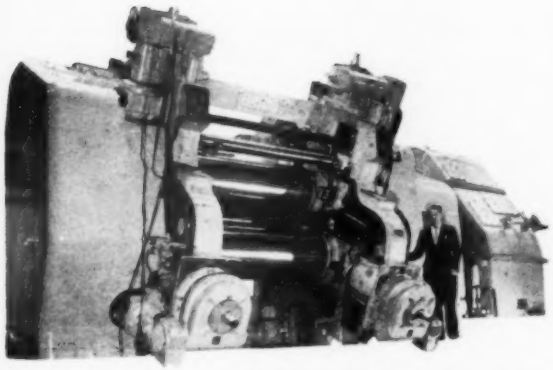
The 12" Extruder (shown above) is one of a range of machines specially designed to receive hot polyethylene, either from a Banbury Mixer or direct from reactors. A range of delivery heads is available and the one illustrated is equipped with a pellet die and adjustable speed pellet cut-off knives operating under water.

The photograph on left shows a Bridge 12" Plastics Extruding Machine, used for polythene and styrene stock. This machine takes a discharge direct from a Banbury Mixer and extrudes either as a sheet or a number of strands by the use of alternative hinged heads.

DAVID BRIDGE & COMPANY LTD

In technical association with FARREL-BIRMINGHAM CO. INC., U.S.A and the NATIONAL RUBBER MACHINERY CO., U.S.A.

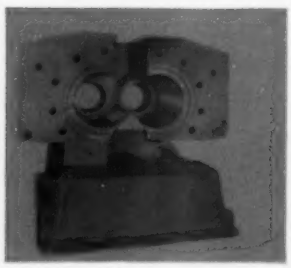
world's finest plastics Machinery



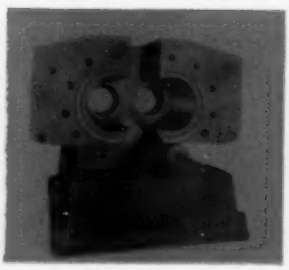
28" x 74" Inclined "Z" Plastics Calender. Incorporates all the finest features of Plastics Calender design including hydraulic loading on the final nip.

Size 11D Banbury Mixer. In addition to many other new developments this high-horsepower mixer is equipped with roller bearings and the new patented hydraulically operated drop-door which facilitates rapid batch discharge and eliminates stock contamination.

design and production efficiency



Drop door in closed position



Drop door partially open

Angular view of drop door in open position

NEW BANBURY DROP-DOOR delivers 3 Big Benefits . . .

(1) LEAKAGE PREVENTION

This new development in Banbury Mixer design is now available as an optional feature on all new production-size machines. The drop-door design does away with a source of leakings and contamination which cannot be avoided with sliding doors.

(2) SHORTER CYCLES

Clearances which permit some leakage are required for the action of sliding doors. This is not the case with the drop-door which is leakproof throughout a full period of normal wear, and there are no tailings left to contaminate a succeeding batch.

(3) ALMOST INSTANTANEOUS DISCHARGE

The opening, discharge and closing cycle of the drop door has been clocked as low as 8 seconds—more than twice as fast as a sliding door. As a result, the overall mixing cycle operation discharge time is in better balance with actual mixing cycle time.

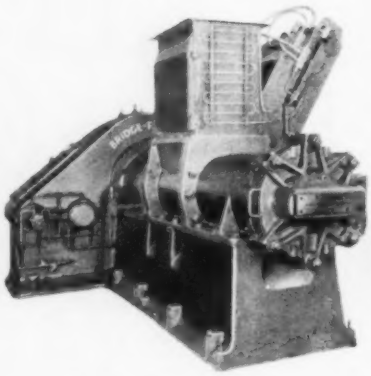
CASTLETON, ROCHDALE, LANCASHIRE, ENGLAND *Telephone: Castleton Rochdale 57216*

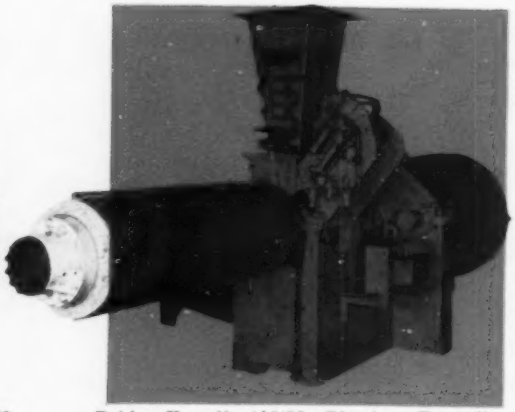
Grams & Cables: Coupling, Phone Castleton, Lancs. · London Office: Broughton House, 6, 7, 8 Sackville St., Piccadilly, W.1

Telephone: Regent 7480. Grams & Cables: Ederaceo, London, W.1

BRIDGE Makers of some of the

Bridge Extruders are an essential link in the chain of continuous expanding production. Being fully automatic with speeds to match the mixing cycle times of the Banbury Mixer, they require no operators, occupy smaller floor space, improve manufacturing efficiency and reduce handling costs.

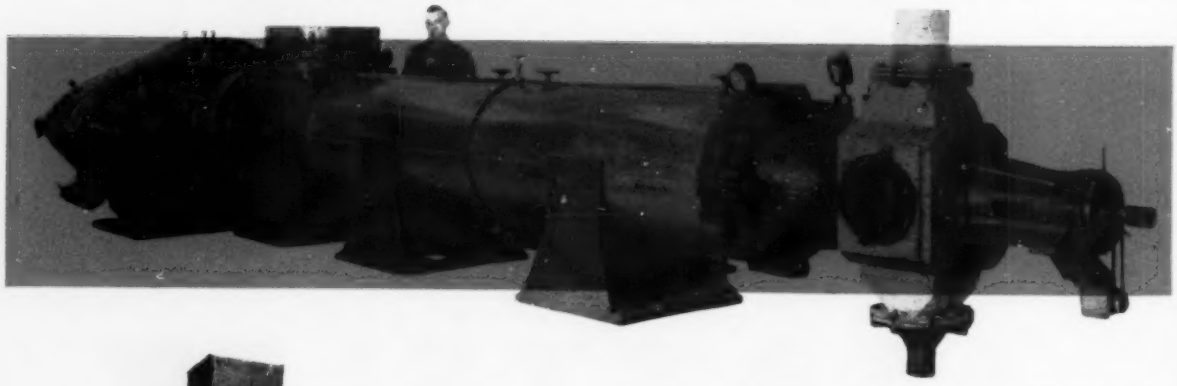


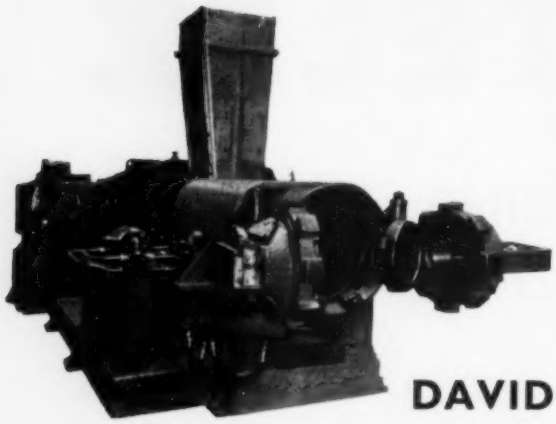


Bridge-Farrell 4½"/8" Plastics Extruding Machine which receives plastics polyethylene stock from the Banbury Mixer and extrudes the material in the form of a strip.

The Plastics Extruder shown above has been specially designed to receive and extrude the batch from the Banbury Mixer under ideal fully controlled thermal conditions and continuously produce strip or rod form from Banbury Mixer cycles as low as two minutes. Such combinations of machines have been designed and developed for various types of plastics and rubber and are the result of a vast background of experience and factory performance in modern methods of manufacture.

. . . acclaimed as the ultimate in





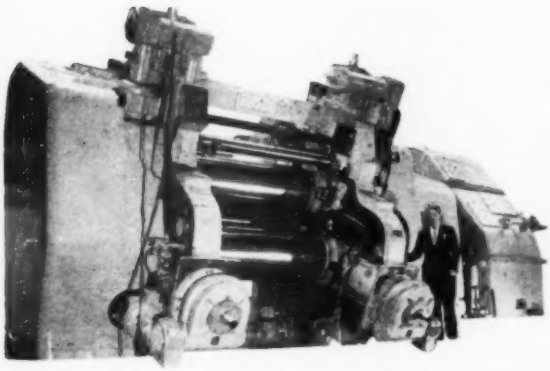
The 12" Extruder (shown above) is one of a range of machines specially designed to receive hot polyethylene, either from a Banbury Mixer or direct from reactors. A range of delivery heads is available and the one illustrated is equipped with a pellet die and adjustable speed pellet cut-off knives operating under water.

The photograph on left shows a Bridge 12" Plastics Extruding Machine, used for polythene and styrene stock. This machine takes a discharge direct from a Banbury Mixer and extrudes either as a sheet or a number of strands by the use of alternative hinged heads.

DAVID BRIDGE & COMPANY LTD

In technical association with FARREL-BIRMINGHAM CO. INC., U.S.A and the NATIONAL RUBBER MACHINERY CO., U.S.A.

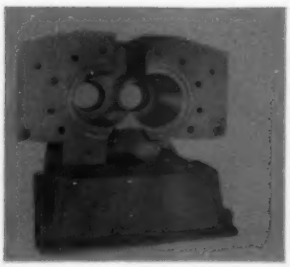
world's finest plastics Machinery



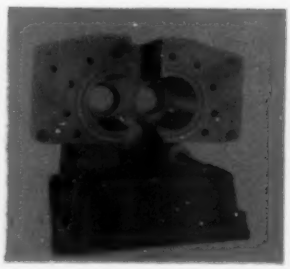
28" x 74" Inclined " Z " Plastics Calender. Incorporates all the finest features of Plastics Calender design including hydraulic loading on the final nip.

Size 11D Banbury Mixer. In addition to many other new developments this high-horsepower mixer is equipped with roller bearings and the new patented hydraulically operated drop-door which facilitates rapid batch discharge and eliminates stock contamination.

design and production efficiency



Drop door in closed position



Drop door partially open

Angular view of drop door in open position

NEW BANBURY DROP-DOOR delivers 3 Big Benefits . . .

(1) LEAKAGE PREVENTION

This new development in Banbury Mixer design is now available as an optional feature on all new production-size machines. The drop-door design does away with a source of leakings and contamination which cannot be avoided with sliding doors.

(2) SHORTER CYCLES

Clearances which permit some leakage are required for the action of sliding doors. This is not the case with the drop-door which is leakproof throughout a full period of normal wear, and there are no tailings left to contaminate a succeeding batch.

(3) ALMOST INSTANTANEOUS DISCHARGE

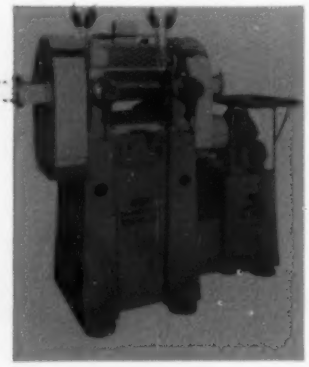
The opening, discharge and closing cycle of the drop door has been clocked as low as 8 seconds—more than twice as fast as a sliding door. As a result, the overall mixing cycle operation discharge time is in better balance with actual mixing cycle time.

CASTLETON, ROCHDALE, LANCASHIRE, ENGLAND *Telephone: Castleton Rochdale 57216*

Grams & Cables: Coupling, Phone Castleton, Lancs. · London Office: Broughton House, 6, 7, 8 Sackville St., Piccadilly, W.1

Telephone: Regent 7480. Grams & Cables: Ederaceo, London, W.1

22" x 60" Heavy Duty Single Geared Mill



Bridge 6" x 12" Double Geared, Double Speed Mi

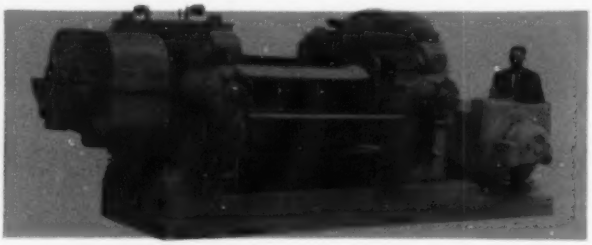
BRIDGE Designed-for-the-job MILLS

For many years it has been the company's practice to ask each customer just what he wants his new Mill to accomplish. . . . What type of stock is to be processed. . . . What is the output required. . . . How accurate must the gauge be. . . . What about temperature . . . and so on. With the answers to these questions, Bridge engineers are in a position to supply a machine that will suit the users' needs exactly.

The Mill required may be a standard machine, a modification of a standard mill, or a new design throughout, depending on the job to be done. Ordinarily, any mill can be supplied from existing drawings and patterns because, in over 40 years of building processing machinery, Bridge have designed mills for almost every conceivable application.

Bridge Mills can be installed very quickly. For example, a Mill with vibro-mountings was delivered from the factory in one piece on a Saturday afternoon; it was in its position on site on Sunday afternoon; the electrical wiring was completed on the Tuesday; it was "run in" all day Wednesday—and went into production on the Thursday. The normal working routine was hardly disturbed at all, as all the major movements of machinery were done in the weekend.

Bridge 22 $\frac{3}{16}$" x 26" x 84" Mill mounted on vibro-insulated fabricated steel bed plates. Photograph shows machine ready for transportation to customer.



Bridge 22" x 60" Heavy Duty, Two-Roll Single-Geared Mill. The National Joint Council's Report on the safe working of horizontal Two-Roll Mills has been taken into account by Bridge in the design of the machine shown above. The base plate is of fabricated steel construction; the vibro-insulators are bolted with the bed plate; slots are provided to enable the vibro-insulators to be adjusted, giving the machine a very clean exterior appearance.

BRIDGE

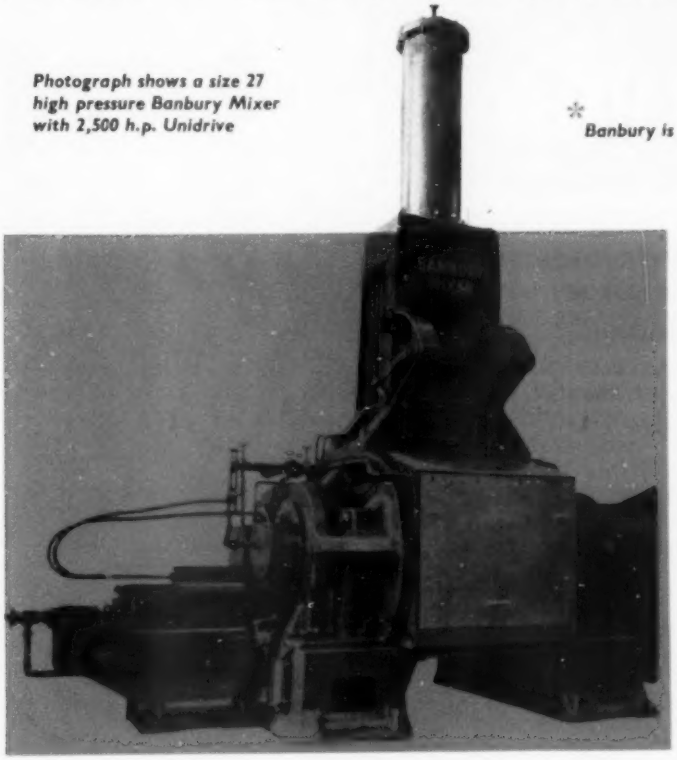
DAVID BRIDGE & COMPANY LIMITED

Specialist Engineers to the Rubber, Plastics, and Associated Industries

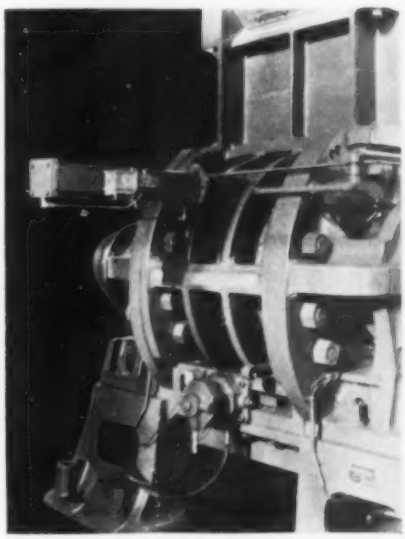
There's a size of *BANBURY MIXER for every production requirement

... varying from the midget laboratory model with a ¾ lb. capacity to the size 27 with the colossal capacity of 1,000 lbs.

Photograph shows a size 27 high pressure Banbury Mixer with 2,500 h.p. Unidrive



*Banbury is a registered trade mark



Banbury Mixers are used for masticating natural rubber, mixing natural and all types of synthetic rubber, processing plastics including vinyl, polyethylene, polystyrene, cellulose compounds, urea resins and paints, mixing asphalt tile, vinyl asbestos, linoleum and other flooring compounds. They are used for reclaiming rubber and plastics scrap. The most recent successful application is for de-watering synthetic rubber. Where two or more of these machines are required to operate together, or where they operate in conjunction with other machines to form a complete production line, the available sizes ensure that they can be matched in capacity to provide a uniform production flow. Many excellent processing set-ups are already in existence but our engineers are ready to assist in working out schemes to suit individual requirements.

Banbury Mixers for De-watering Synthetic Rubbers

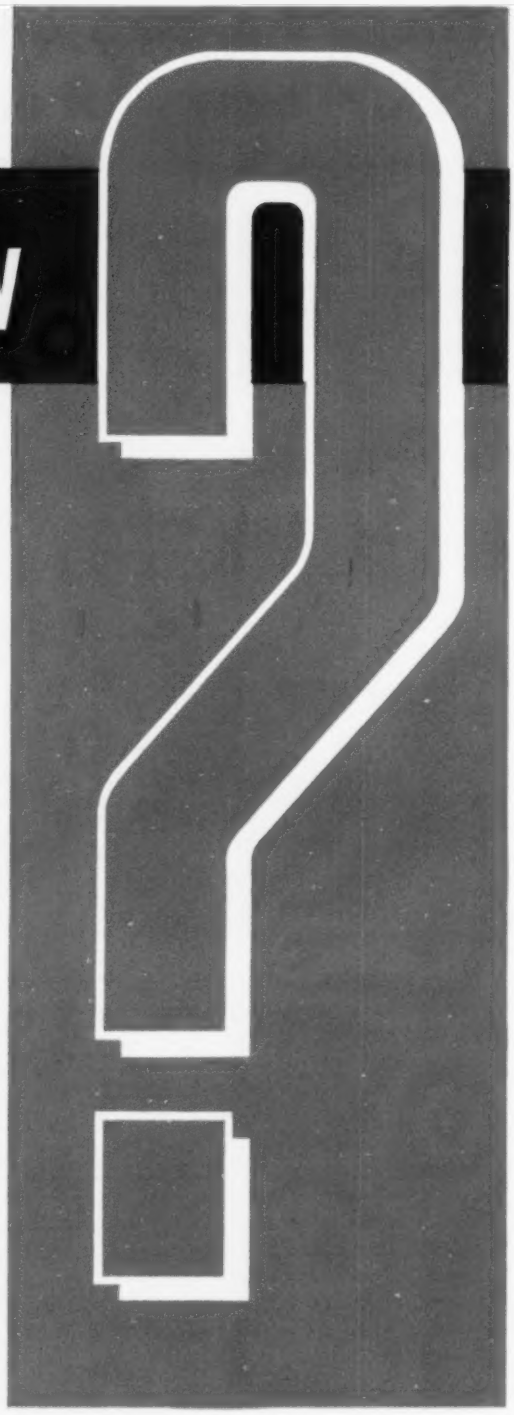
Production-size Banbury Mixers with special features necessary for de-watering synthetic rubbers are now available. The machines are of the high-horsepower Uni-drive type, with drop-door and self-sealing dust stops, and special fittings for draining the water squeezed from the slurry by the action of the ram. Following this, intense shearing action is applied to the rubber causing internal heating above the boiling point of water, eliminating preliminary pressing of the slurry and final drying of the rubber. The machines are designed for high outputs, and the simultaneous batching of compounding ingredients is possible.

In technical association with
FARREL-BIRMINGHAM CO. INC., Ansonia, Conn., U.S.A., and the NATIONAL RUBBER MACHINERY CO., U.S.A.

CASTLETON, ROCHDALE, LANCASHIRE, ENGLAND

Telephone: Castleton Rochdale 57216 Grams & Cables: Coupling, Phone Castleton, Lancs. London Office: Broughton House, 6, 7, 8 Sackville St., Piccadilly, W.1 Telephone: Regent 7480 Grams & Cables: Ederaceo, London, W.1

Did you know



. . . that there is a ROBAC Accelerator for most types of Synthetic Rubber?

POLYCHLOROPRENE

ROBAC D.E.T.U.	The Accelerator for Continuous curing of extruded sections
ROBAC 22	General purpose
ROBAC D.F.T.U.	Freedom from Scorch
ROBAC Z.I.X.	Low temperature curing

NITRILE

ROBAC THIURAM P.25	Low Compression Set
ROBAC T.M.S.	General purpose

S.B.R.

ROBAC CuDD	Fast Curing
ROBAC P.T.M.	Delayed Action and Fast Curing

SULPHONATED POLYCHLOROPRENE

ROBAC THIURAM P.25 ROBAC 22	General purpose

BUTYL

ROBAC THIURAM P.25	'Plateau Modulus'

ROBAC ACCELERATORS

For further information, write, 'phone or call:

ROBINSON BROTHERS LIMITED, RYDERS GREEN, WEST BROMWICH. *Telephone: West Bromwich 2451-3*

M-W.77

Editorial Director: J. D. COPEMAN

Editor: PETER RANSLEY

Technical Editor: RICHARD NYE, MA

Consultant Editor: W. S. PENN, BSc

Advertisement Director: EDWARD J. BYFIELD

Advertisement Manager: MICHAEL J. WHELAN

UK Area Representatives

L. Quy, South and West of England and South Wales (Operating from London Office)

A. J. Legg, Area Manager, 55 Lee Lane West, Horsforth, Nr. Leeds. Tel. No. Horsforth 3845. North-East England, Lancashire, Yorkshire and Lincolnshire

E. R. Leaver, Group Advertising Manager, Scotland (Operating from London Office)

W. Brown, Area Manager, 13 Allerton Road, Southport, Lancashire. Tel. No. Southport 5121. Cheshire, Cumberland, Westmorland

E. Burgess, 40 Parkside Drive, Maybank, Newcastle-under-Lyme. Tel. No. 64678, Staffordshire North of the A.5

W. J. Bird, 2 Christopher Road, Quinton, Birmingham, 32. Tel. Woodgate 5804. Derbyshire, Shropshire, South Staffs., Leicestershire, Nottinghamshire, Warwickshire, Worcestershire and N. Wales

Overseas Representatives

Belgium—Albert Milhado & Co., GmbH, Pompstraat 2, Antwerp

France—John Gentry, 150 Boulevard Magenta, Paris X

Germany—Albert Milhado & Co., GmbH, Charlottenstrasse 32, Dusseldorf. Tel. No. 27217

Italy—Massimo Fano, Via V. Monti 14, Milan. Tel. No. Milan 808135

Netherlands—G. Arnold Teesing, Rubensstraat 68, Amsterdam, Z. Tel. No. 727913

United States—Overseas Publishers' Representatives, 29 West 34th Street, New York 1, N.Y. Tel. No. Bryant 9-0794

RUBBER and PLASTICS WEEKLY

Formerly 'Rubber Journal and International Plastics'

Volume 141 *IN ITS 78th YEAR* **No. 17**

October 21 1961

Editorial

NOTES OF THE WEEK 605

Articles and News

NEWS BRIEFS 606
QUICK RECOVERY FROM FIRE 607
EXPORT TOURS OF EUROPE 610
EXPORT SURVEY CONTENTS **613**
THE PRICE OF FOAM 656
UK INJECTION MOULDING MACHINES 659
DITHIOL CURE IN CHLORINATED BUTYL 666
ORGANOTIN STABILIZERS 669
COMPOUNDING DEVELOPMENTS 671
DIP-COATING IN PLASTICS 674
PLASTICS MACHINERY DEVELOPMENTS 678

Features

VIEWS AND REVIEWS 608
MEN AND MATTERS 611
THE LEGAL ANGLE 612
PLASTICS STATISTICS 679
RUBBER STATISTICS 679
PLANTATION NEWSLETTER 680
INDUSTRY INTELLIGENCE 681

Classified Advertisements . . . 684 Advertisers Index . . . 709

MACLAREN HOUSE, 131 GREAT SUFFOLK STREET, LONDON, S.E.1
Grams: 'Buns, Souphone, London' Phone: HOP 5712

Annual Subscription, including Postage: United Kingdom and Oversea, £2 15s.; Index (half-yearly), 10s. per annum extra. Published weekly. Registered at GPO as a Newspaper. Registered for Transmission by Canadian Magazine Post. Entered as Second Class matter at Post Office, Boston, Mass. USA, under the Act of March 3 1879 (Sec. 397 P. L. and R.)

SCREWS, BARRELS & LINERS FOR PLASTIC EXTRUDERS
ALL SIZES CONSTANT OR VARIABLE PITCH

Also manufacturers of

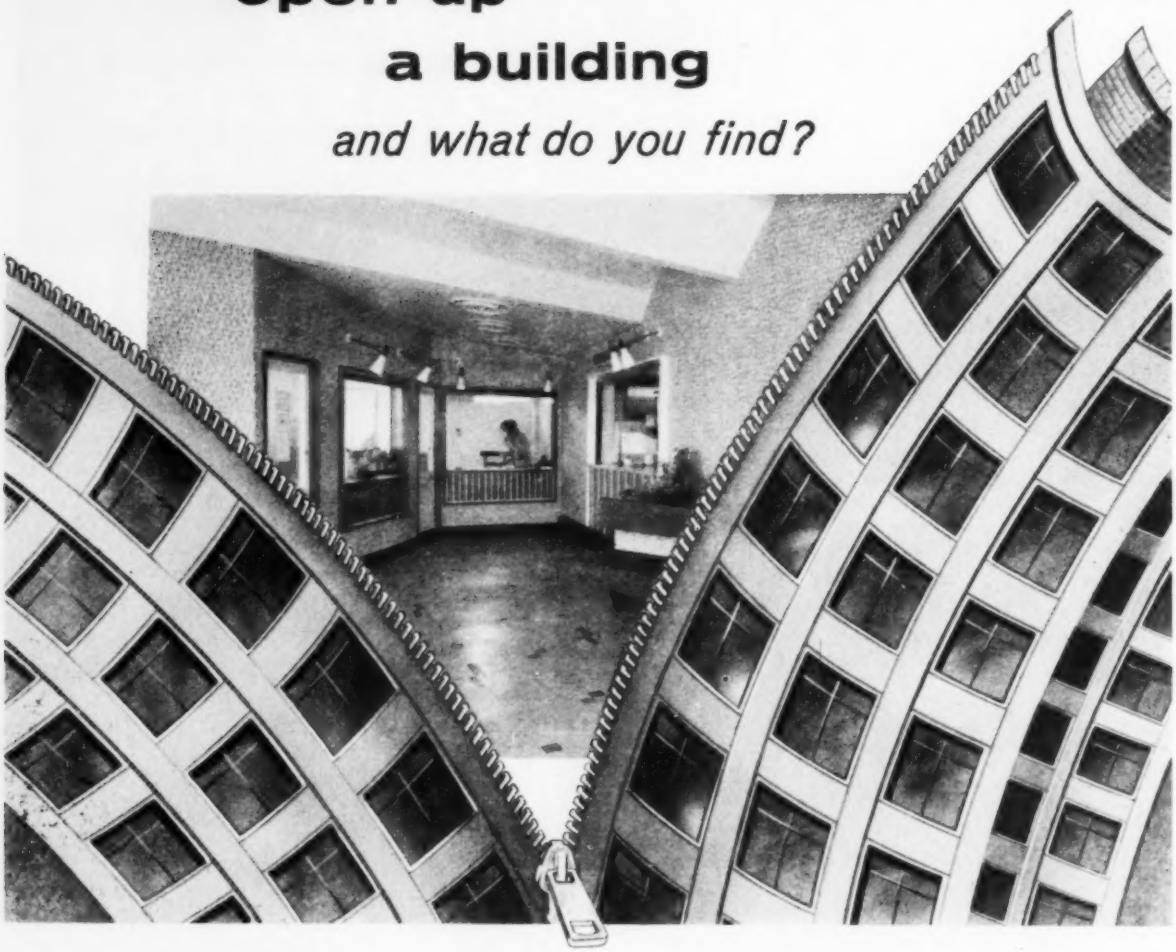
SPIRAL MARKING MACHINES
FOR PLASTIC CABLE IDENTIFICATION

BUNCHING & TWINNING MACHINES
STRANDING MACHINES
PAPER LAPPING MACHINES
PAY OFF & TAKE UP STANDS

JOHN DOCKER & CO. (ENGINEERS) LTD.
CROMWELL WORKS, NORTH FELTHAM TRADING ESTATE, FELTHAM, MIDDLESEX. TEL: FELTHAM 6341
GRAMS: DOCREBUILT, FELTHAM
CABLES: DOCREBUILT, LONDON

open up a building

and what do you find?



plastics, plastics, everywhere!

GEON PVC, for example, as floor-covering and wall covering, curtaining and upholstery, grilles and cable sheathing.

STYRON Polystyrene as wall tiles and ceiling louvres, electrical fittings and door handles.

CELLOBOND Polyester Resins as roof lights and wash basins, cisterns and toilet suites.

RIGIDEX Polyethylene as light fittings and piping, containers and housewares.

EPOK Surface Coating Resin—some water soluble, some spirit soluble—the basis of paints of all kinds.
These are just some of the materials supplied to industries all over the world by this vigorous group of companies.

Write today for full information.

Geon, Styron, Cellobond, Epok are reg'd trade marks.
Rigidex is a reg'd trade mark of British Hydrocarbon Chemicals Ltd and one of the products they manufacture at Grangemouth.

British Geon Ltd	British Resin Products Ltd	Distrene Ltd	COMPANIES IN THE DISTILLERS PLASTICS GROUP

HEAD OFFICE: DEVONSHIRE HOUSE · PICCADILLY · LONDON W1 · ENGLAND

Distillers Plastics Serve Everyman

Summary of the Principal Articles

The UK and the Common Market 615

The direct effects on rubber of Britain's entry into the Common Market should be negligible. In the case of natural rubber tariffs and quotas do not affect the pattern of imports. The UK levies a general duty of 10% on synthetic rubber; entry is already duty free in all Common Market countries and there is to be no common external tariff. But the abolition of the UK duty would have little effect on British industry.

Indirectly, however, UK rubber consumption should be stimulated by our entry into the larger Common Market, if it means — as it presumably will — more rapid economic expansion accompanied by a growing demand for rubber manufactures. The prospects for increasing our exports of rubber goods, such as tyres, to the Common Market are promising, particularly as current tariffs are high and the UK rubber manufacturing industry is competitive.

The outlook for plastics polymers is mixed but on the whole good. UK tariffs on the major thermoplastics are not exceptionally heavy, but manufacturers will face increasing competition from European producers with excess capacity. However, UK plastics manufacturers are part of large and efficient organizations and should be able at least to hold their own, although particularly in the case of pvc polymers, it may prove difficult to prevent an increase in imports. However, overall UK plastics consumption will grow sharply during the 1960's and home producers of most types will benefit from this.

The Price of Foam 656

The technical consequences of replacing natural by synthetic latex in foam have been examined, and more particularly the assumption that when the price of natural rubber is higher than of synthetic a saving in production cost must flow from a more extensive use of synthetic. The conclusion is reached that within a probable range of price fluctuations the apparent economy of replacing natural by synthetic latex in foam is largely illusory.

British Injection Moulding Machinery 659

The growth of the British plastics machinery industry has been rapid over the past few years. Injection machine manufacturers have been to the forefront of this development and there are now as many as 30 producers or suppliers.

Although a number of companies still manufacture only normal plunger type machines, the majority employ preplasticization techniques in one form or another. There are 'in-line' screw preplasticizers and auxiliary screws and plungers. The advantages of improved melt characteristics given by these techniques are fully discussed and a comparison is made between the various methods.

Injection moulding techniques are discussed in general and associated with British developments and available equipment. Modern injection moulding procedure is discussed so that the advantages of British machines may be seen. A catalogue of nearly all British manufacturers is given with an indication of the type of machine that each one makes. Wherever the equipment has a special feature this is discussed and includes such factors as the use of vertical space saving plungers with special spreaders; valves to prevent backflow of melt; interchangeable screws for greater versatility; equipment for conversion of plunger types to preplasticization types and machines for handling inserts. Both British firms and those producing or distributing machines for Continental and US companies are included so that a complete picture of the industry is obtained.

Dithiol Cure in Chlorinated Butyl 666

Chlorinated butyl rubber can be vulcanized by a much wider range of curing systems than can unhalogenated butyl. Of the many curing agents which can be used with chlorobutyl, the dithiols are arousing considerable interest because they produce fast curing compounds with high modulus, low compression set and good flexing properties. Glycol dimercapto acetate is now available from two UK manufacturers and is the only dithiol of practical application at the moment. It has the advantage that it does not impart a pronounced odour to the compound as do the simpler dithiols.

The article discusses this material as a vulcanising ingredient for chlorinated butyl rubber, comparing it with the generally recommended TMT/MBTS curing system. It enables chlorobutyl to be vulcanized to give a snappy, resilient compound and such compounds are finding use in applications where the valuable properties normally associated with butyl, together with the high modulus and quick recovery from deformation characteristic of this curing system, are required.

Developments in Organotin Stabilizers 669

Despite the relative decline in the USA, world production of organotin stabilizers is rising and is now in the reach of 1,500 tons per annum.

Great interest is developing in Europe in the non-toxic octyltin stabilizers. A new Swiss octyltin is announced which, unlike those previously manufactured, is more powerful than the standard butyltin stabilizers. The question of toxicity approvals is discussed.

The principal defects of the butyltin stabilizers are price, odour and the tendency to stick to mill and calender rolls, etc. These problems are being solved and progress on these lines is reviewed.

New powder dispersions of organotin stabilizers for easy mixing in rigid compounds have been introduced.

The economics of organotin stabilization are reviewed and the present state of the battle between organotin stabilizers and barium-cadmium stabilizers is described.

The future course of development in the stabilizer field with particular reference to the organotins is adumbrated and the extraordinary growth of the organotin stabilizers in Japan is discussed.

Compounding Developments 671

The paper deals with the use of a chemical modifying agent for natural rubber/SBR and with developments which have taken place in the proper selection of antiozonants for specific service conditions. Particular reference is made to tyres.

Recent work has been carried out to study the effect of promoters such as those used in butyl rubber in natural rubber/SBR blends. By the use of N, 4-dinitroso-N-methylaniline, tyre compounds can now be produced based on a 50/50 blend which will exhibit reduced hysteresis and hence reduced heat build-up under severe flexing conditions. This improved property is of particular value in heavy-duty tyres where hitherto the higher heat build-up properties of SBR-based compounds have prevented their use. Possibilities are therefore indicated of extending the range of tyre sizes in which SBR can be used successfully to replace the more expensive natural rubber and thus result in reduced costs. Compounding follows the same procedure as already used for carbon-black masterbatching in internal mixers.

Although the effectiveness of antiozonants in reducing the development of cracking in rubber is now widely appreciated, the proper selection of the best antiozonants available is essential. From the information now available, each class of antiozonant can be considered on its merits and the appropriate selection made with confidence. Combinations for products under static strain and under continuous dynamic flexing are considered. For intermittent-dynamic service conditions, such as a tyre sidewall, a combination of selected wax, 6-ethoxy-2,2,4-trimethyl-1, 2-dihydroquinoline and N-isopropyl-N'-phenyl-p-phenylene diamine has been found to produce the best results. This particular combination has been found effective in SBR as well as in natural rubber.

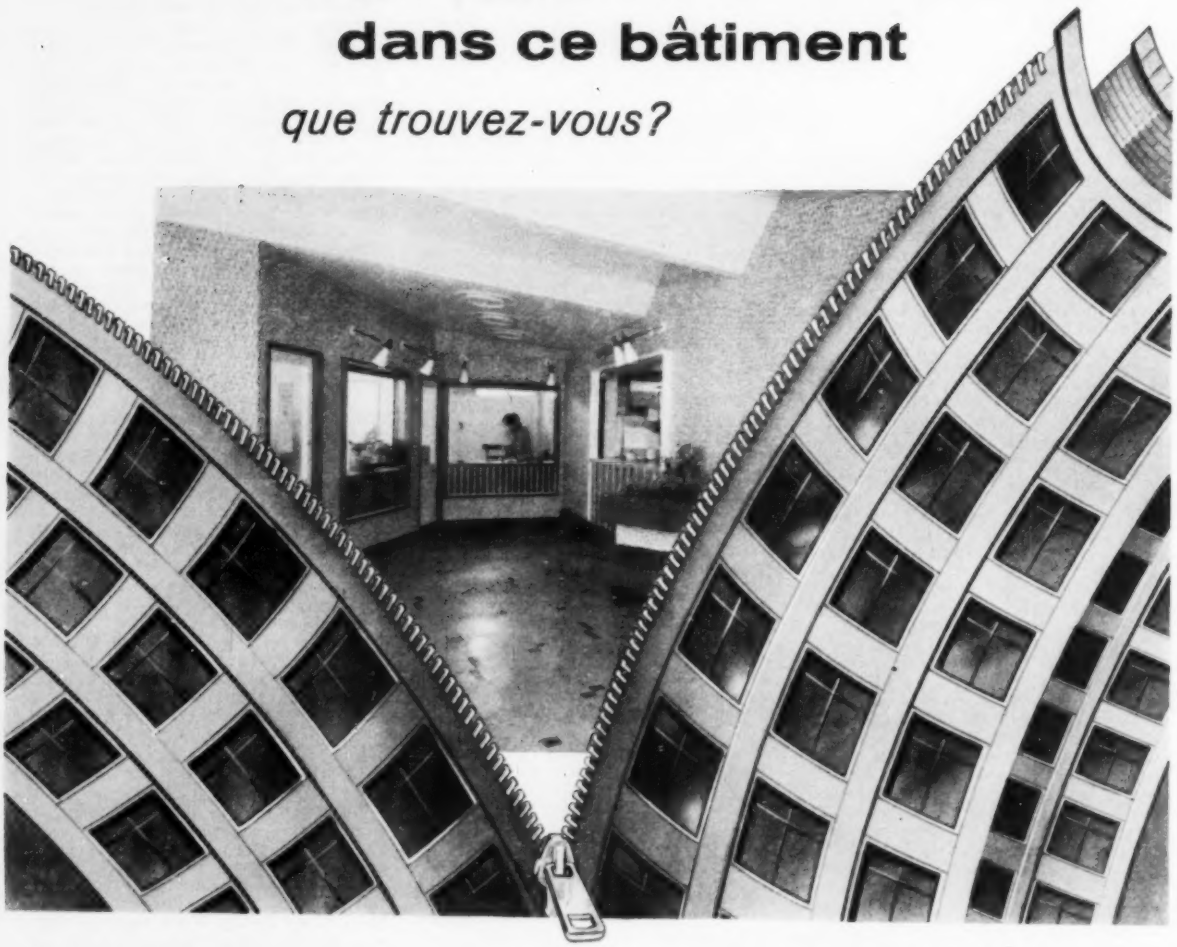
Advances in Plastics Dip-coating 674

Hot-dip coating in plastics powders has, since the late forties, provided a useful alternative to stove enamelling and other non-vitreous finishes. At first polythene was the only material available for the process, but though it still holds its place as a general-purpose coating medium, it is now but one of a range of plastics powders, the introduction of which have greatly increased the scope of the method. The newer powders include cab, which gives a high-gloss finish, and pvc and nylon, both extremely tough and durable. An important recent addition is epoxy resin powder. Although, unlike the other materials mentioned, this is a thermosetting powder, only slight alterations in technique are needed to apply it, and the result is a finish of high thermal and electrical resistance, suitable for the insulation of such articles as stators and rotors for electrical machinery.

Alongside the developments in materials have come improvements in the process itself, which for some years was almost entirely a hand-operation. The first step toward putting the process on a mass-production basis was the application of the fluidization principle to the powder, which made the actual dipping stage faster and more reliable. Now new equipment is being developed, e.g. conveyorized heating and dipping systems, with the object of ultimately mechanizing the process completely.

As materials and techniques become more versatile, dip-coating will not only take a firmer and firmer place among existing finishing methods, but will find applications of a totally different type, particularly in the electronics and electrical industries.

regardez!
dans ce bâtiment
que trouvez-vous?



du plastique, encore du plastique, partout du plastique!

BREON PVC, par exemple, comme revêtements de sols et de murs, rideaux et tapisserie d'ameublement, grilles et gaines de câbles.

STYRON: polystyrène comme carreaux de revêtement de murs, et ouvertures de plafond, installations électriques et poignées de portes.

CELLOBOND: résines de polyesters comme lucarnes de toit, et lavabos, réservoirs et installations sanitaires.

RIGIDEX: polyesthyrène comme installations d'éclairage et canalisations, conditionnements et articles de ménage.

EPOK: résines de revêtement de surface — les unes solubles dans l'eau, les autres dans l'alcool — et la base de peintures de toutes sortes. Et ceci n'est qu'une sélection des matériaux fournis à l'industrie du monde entier, par ce vigoureux groupe de sociétés.

Ecrivez aujourd'hui même pour recevoir tous les renseignements complémentaires.

Breon, Styron, Cellobond, Epok sont des marques déposées.
Rigidex, marque déposée de British Hydrocarbon Chemicals Ltd.
est l'un des produits manufacturés à Grangemouth.

British Geon Ltd	British Resin Products Ltd	Distrene Ltd	COMPANIES IN THE DISTILLERS PLASTICS GROUP

BUREAU PRINCIPAL: DEVONSHIRE HOUSE · PICCADILLY · LONDRES W1 · ANGLETERRE

Sommaire des Principaux Articles

Grande-Bretagne et le Marché Commun 615

Les effets directs sur le caoutchouc de l'entrée de la Grande-Bretagne dans le Marché Commun devraient être négligeables. Pour ce qui est du caoutchouc naturel, les tarifs et les contingents n'affectent pas l'aspect des importations. Le Royaume-Uni impose un droit de 10 pour cent sur le caoutchouc synthétique; l'entrée est déjà exempte de droits dans tous les pays du Marché Commun et il n'y aura pas de tarif extérieur commun. Mais l'abolition des droits du Royaume-Uni n'aurait que peu d'effet sur l'industrie anglaise.

Indirectement, pourtant, la consommation de caoutchouc du Royaume-Uni devrait être stimulée par notre entrée dans le Grand Marché Commun, si cela signifie —comme cela sera probablement le cas— une expansion économique plus rapide, accompagnée d'une demande croissante de produits manufacturés en caoutchouc. Les perspectives d'augmentation de nos exportations d'articles en caoutchouc, tels que pneus, vers le Marché Commun sont prometteuses, surtout du fait que les tarifs actuels sont élevés et que l'industrie manufacturière du caoutchouc anglaise est 'compétitive'.

Les perspectives quant aux polymères plastiques sont mêlées mais, dans l'ensemble, sont bonnes. Les tarifs du Royaume-Uni sur les thermoplastiques les plus importants ne sont pas exceptionnellement lourds, mais les fabricants feront face à une concurrence croissante de la part des producteurs européens ayant un surplus de capacité productrice.

Cependant les fabricants de plastiques du Royaume-Uni font partie d'une vaste organisation efficace et, au moins, ils devraient être en mesure de bien se défendre, quoique, en particulier dans le cas des polymères pvc, il puisse s'avérer difficile d'empêcher une augmentation des importations.

Le Prix de la Mousse 656

On a examiné les conséquences techniques du remplacement du latex naturel par le latex synthétique pour la mousse, et plus particulièrement la supposition suivant laquelle, lorsque le prix du caoutchouc naturel est plus élevé que celui du caoutchouc synthétique, une économie sur le coût de production doit nécessairement découler de l'emploi plus poussé du synthétique. On en arrive à la conclusion que, dans une plague probable de fluctuations des prix, l'économie apparente réalisée en remplaçant le latex natural par du latex synthétique n'est, somme toute, qu'illusoire.

L'Industrie Anglaise des Machines de Moulage par Injection 659

La croissance de l'industrie anglaise des machines pour les plastiques a été rapide au cours de ces dernières années. Les constructeurs de machines à injection se sont trouvés à la tête de ce progrès et l'on compte actuellement jusqu'à trente producteurs ou fournisseurs.

Bien qu'un certain nombre de firmes ne fabriquent encore que des machines du type normal à piston plongeur, la plupart emploient des techniques de plastification préalable sous une forme ou sous une autre. Il y a les pré-plastifiants à vis 'en ligne' et les vis et pistons auxiliaires. Les avantages des caractéristiques améliorées du mélange fondu que donnent ces techniques font l'objet d'une discussion complète et il est établi des comparaisons entre les diverses méthodes.

Les techniques de moulage par injection sont étudiées de façon générale, par rapport aux progrès anglais et au matériel disponible. L'article traite des procédés modernes de moulage par injection, pour faire ressortir les avantages des machines anglaises. On donne aussi une liste cataloguée de presque tous les constructeurs anglais, avec indication du type de machine que chacun d'eux fabrique. On y trouve les firmes anglaises et celles qui fabriquent ou distribuent des machines pour le compte de sociétés du Continent et des Etats-Unis, de façon à présenter un ableau complet de toute cette industrie.

Les Dithiols Dans la Vulcanisation du Butyle Chlore 666

On peut vulcaniser le caoutchouc butyle chloré par une bien plus grande gamme de systèmes de vulcanisation que pour le butyle non halogéné. De tous les agents de vulcanisation nombreux qui peuvent s'employer pour le chlorobutyle, les dithiols suscitent actuellement un grand intérêt, car ils permettent d'obtenir des mélanges à cuisson rapide qui présentent un module élevé, un faible taux de déformation permanente par compression et de bonnes qualités de résistance à la flexion. L'acétate de glycol di-mercapto peut à présent s'obtenir chez deux fabricants du Royaume-Uni et c'est le seul dithiol pouvant s'employer en pratique pour le moment.

Cet article traite de ce produit employé comme ingrédient de vulcanisation pour le caoutchouc butyle chloré, en le comparant au système de vulcanisation TMT/MBTS généralement recommandé.

Progres des Stabilisateurs 'Organotin' 669

En dépit du déclin relatif aux USA, la production mondiale de stabilisateurs 'organotin' augmente, aux approches à présent de 1.500 tonnes par an.

Un grand intérêt se manifeste progressivement en Europe pour les stabilisateurs 'octylin' non-toxiques. Dans cet article, on discute la question des approbations de toxicité.

Les principaux défauts des stabilisateurs 'butyltin' sont leur prix, odeur et tendance à coller aux cylindres des malaxeurs et des calandres, etc. Ces problèmes sont actuellement sur le point d'être résolus et les progrès accomplis en la matière sont passés en revue.

On a mis au point de nouvelles dispersions pulvérulentes de stabilisateurs 'organotin' pour le mélangeage facile dans les préparations rigides.

On étudie ici le point de vue économique de la stabilisation par 'organotin' et l'on décrit l'état actuel de la lutte entre les stabilisateurs 'organotin' et les stabilisateurs baryum-cadmium.

L'auteur esquisse le cours futur du développement dans le domaine des stabilisateurs, en se référant tout particulièrement aux 'organotins' et discute de l'extraordinaire croissance des stabilisateurs 'organotin' au Japon.

Du Nouveau dans le Melangeage 671

Cet article traite de l'emploi d'un agent modificateur chimique pour le caoutchouc naturel SBR et des faits nouveaux qui se sont produits quant au choix approprié d'antiozonants pour des conditions d'utilisation spécifiques. Il est question des bandages pneumatiques en particulier.

Des travaux ont récemment été faits en vue d'étudier l'effet d'activants tels que ceux qui s'emploient dans le caoutchouc butyle dans des combinaisons de caoutchouc naturel et de SBR. En employant de la N,4-dinitroso-N-aniline métylique, on peut à présent obtenir des préparations de caoutchouc pour pneus établies par un mélange de 50 pour 50 qui présentera une hystérésis amoindrie et, de ce fait, une accumulation de chaleur réduite en présence d'intenses flexions. L'Amélioration de cette propriété offre un avantage spécial dans la fabrication des pneus pour service intensif, pour lesquels on ne pouvait jusqu'à présent employer des caoutchoucs à base de SBR du fair de leurs propriétés plus marquées quant à la création de chaleur progressive.

Bien que l'efficacité des antiozonants pour réduire l'apparition des fendillements dans le caoutchouc soit aujourd'hui pleinement appréciée partour, il importe absolument de faire, entre les meilleurs antiozonants disponibles, la sélection qui convient. D'après les renseignements dont on dispose à présent, chaque catégorie d'antiozonant peut être envisagée suivant ses avantages particuliers et l'on peut procéder avec confiance à la sélection qui convient. On étudie des combinaisons pour des produits faisant l'objet de tension statique et sonmis à la flexion dynamique continuelle. Pour les conditions de service dynamique intermittent, comme par exemple le travail de la pario d'un pneu, on a constaté l'obtention des meilleurs résultats en prenant une combinaison de cire choisie, 6-éthoxy-2,2,4-triméthyl-1, 2-dihydroquinoline et de N'-phényl-p-phénylène diamine.

Progres de l'enduisage par immersion dans les plastiques 674

L'enduisage par immersion à chaud dans les poudres de plastiques, depuis un peu avant 1950, a fourni une solution d'échange utile au procédé de laque cuite au four et autres finitions non-vitreuses. Au début, le polythène était la seule matière disponible pour ce procédé, mais bien qu'il tienne toujours une bonne place comme moyen d'enduisage pour travaux généraux, il n'est plus à présent que l'un d'une gamme entière de poudres plastiques, dont la mise au point a énormément élargi les possibilités de cette méthode. Les poudres plus récentes comprennent le cab, qui donne un fini extrêmement brillant, et le pvc et le nylon, tous deux très résistants et durables. Une importante addition récente est la poudre de résine époxy.

En même temps que les progrès pour les matières, il y a eu aussi des améliorations quant au procédé lui-même, qui, pendant plusieurs années, était presqu'entièrement une opération manuelle. La première étape vers la mise de ce procédé sur une base de production de série fut l'application du principe de liquéfaction aux poudres, ce qui rendit le stade de l'immersion elle-même plus rapide et plus sûr. A présent, on met au point de nouveaux équipements, dans le but d'une mécanisation complète éventuelle de ce procédé.

aufgepasst!

was gibt's in diesem gebäude zu sehen?

plastik, plastik, überall plastik!

BREON P.V.C. zum Beispiel, als Fussbodenbelag und Wandverschalung, als Gardinen und Möbelbezüge, Gitter- und Kabelverkleidung.

STYRON Polystyren, für Wandfliesen und Deckenöffnungen, elektrisches Zubehör und Türgriffe.

CELLOBOND Polyester Kunstharze für Dachbeleuchtung und Waschbecken, für Wasserbehälter und sanitäre Einrichtungen.

RIGIDEX Polyäthylen, als Beleuchtungskörper und für Leitungen, für Behälter und Haushaltsartikel.

EPOK Deckanstrich Kunstharz — teils wasserlöslich, teils alkohollöslich — die Grundlage für Farben aller Art.

Und dies ist nur eine Auswahl aus den Erzeugnissen, mit denen diese emporstrebende Gruppe von Gesellschaften die Industrie der ganzen Welt beliefert.

Schreiben Sie noch heute um ausführliche Information.

Breon, Styron, Cellobond und Epok sind eingetragene Warenzeichen. Rigidex ist ein eingetragenes Warenzeichen der British Hydrocarbon Chemicals Ltd. und eines der in Grangemouth hergestellten Erzeugnisse.

British Geon Ltd | British Resin Products Ltd | Distrene Ltd | COMPANIES IN THE DISTILLERS PLASTICS GROUP

HAUPTGESCHÄFTSSTELLE: DEVONSHIRE HOUSE, PICCADILLY, LONDON W.1, ENGLAND

Zusammenfassungen der Leitartikel

Grossbritanniens und Gemeinsamen Markt 615

Der unmittelbare Einfluss des Beitritts Grossbritanniens zum Gemeinsamen Markt dürfte in Bezug auf Kautschuk unwesentlich sein. In Bezug auf Naturgummi wird das Bild der Einfuhr durch Tarife und Quoten nicht berührt. Der allgemeine britische Einfuhrzoll auf synthetischen Kautschuk beträgt 10%; die Einfuhr ist bereits heute in allen Ländern des Gemeinsamen Marktes zollfrei und es besteht nicht die Absicht, einen gemeinsamen externen Zolltarif einzuführen. Die Aufhebung des britischen Zolles würde jedoch die britische Industrie nur in sehr geringem Umfang treffen.

Indirekt sollte aber durch unseren Beitritt zum grösseren Gemeinsamen Markt der Kautschukverbrauch in Grossbritannien angeregt werden, falls der Beitritt, wie dies zu erwarten ist, eine rasche wirtschaftliche Ausdehnung bedeuten wird, begleitet von einer gesteigertin Nachfrage nach Kautschukerzeugnissen. Die Aussichten auf ein Anwachsen unserer Exporte von Kautschukartikeln wie z.B. Reifen in das Gebiet des Gemeinsamen Marktes sind vielversprechend, besonders da die bestehenden Zolltarife hoch sind und die britische kautschukverarbeitende Industrie konkurrenzfähig ist.

Die Aussichten für Kunststoffpolymere sind gemischt, im ganzen und grossen jedoch günstig. Die britischen Zölle auf wichtige thermoplastische Artikel sind nicht übermässig hoch, doch werden die Fabriken einer zunehmenden Konkurrenz seitens europäischer Produzenten mit überschüssiger Kapazität ausgesetzt sein. Die britischen Kunststoffproduzenten gehören jedoch bedeutenden und leistungsfähigen Organisationen an und sie sollten zumindest in der Lage sein, ihren Platz zu behaupten, obgleich es sich besonders im Falle von pvc Polymeren als schwierig erweisen dürfte, eine Steigerung der Einfuhr zu verhindern.

Der Preis des Schaumgummis 656

Die technischen Folgen des Ersetzens natürlichen durch synthetischen Latex in Schaumgummi sind einer Prüfung unterzogen worden und zwar besonders hinsichtlich der Annahme, dass, im Falle eines höheren Preises von Naturgummi als des von synthetischem Kautschuk, eine Ersparnis in Produktionskosten durch ausgedehntere Verwendung synthetischen Materials also natürliche Folge zu betrachten wäre. Die Schlussfolgerung lautet, dass im Rahmen der wahrscheinlichen Preisschwankungen die scheinbare Wirtschaftlichkeit eines Ersetzens natürlichen durch synthetischen Latex in Schaumgummi zum Grossteil illusorisch ist.

Die Britische Spritzgussmaschinen-Industrie 659

Die Entwicklung der britischen Kunststoffmaschinen-Industrie ist in den letzten Jahren rapid gewesen. Im Vordergrund dieser Entwicklung standen Hersteller von Spritzgussmaschinen und es gibt heut nicht weniger als dreissig Erzeuger bezw. Lieferanten.

Obgleich eine Anzahl von Fabriken auch weiterhin normale Kolbentyp-Maschinen erzeugen, verwendet der Grossteil Vorplastifizierungsmethoden in der einen oder anderen Form. Es gibt 'Reihen' - Schneckenvorplastifizierer, ebenso wie Hilfsschnecken und Kolben. Die durch diese Methoden gebotenen Vorteile verbesserter Schmelzmerkmale werden eingehend besprochen und es wird ein Vergleich zwischen den verschiedenen Verfahren gezogen.

Spritzgussverfahren werden allgemein besprochen und mit britischen Entwicklungen, sowie der verfügbaren Ausrüstung in Zusammenhang gebracht. Das moderne Spritzgussverfahren wird erörtert, um die Vorzüge der britischen Maschinen klar erscheinen zu lassen. Es wird ein Verzeichnis nahezu aller britischen Erzeuger mit Angabe des Typs gegeben, den jeder von ihnen herstellt. Dieses Verzeichnis enthält sowohl britische Firmen als auch solche, die Maschinen für kontinentale und amerikanische Gesellschaften produzieren bezw. verkaufen, wodurch eine komplette Übersicht über die Industrie erzielt wird.

Die Dithiolvulkanisation in Chloriertem Butyl 666

Für chlorierten Butylkautschuk steht eine viel ausgedehntere Auswahl von Vulkanisierungsverfahren zur Verfügung als für nichthalogeniertes butyl. Von den zahlreichen Vulkanisationsmitteln, die mit Chlorbutyl verwendet werden können, erwecken die Dithiole reges Interesse, da sie rasch vulkanisierende Verbindungen herstellen, die sich durch ein hohes Modul, sowie durch niedrige Druckdeformation und gute Biegeigenschaften auszeichnen. Glykol Dimercaptanazetat wird nun von zwei britischen Herstellern geliefert und dies ist derzeit der einzige in der Praxis verwendete Dithioltyp.

Der Artikel befasst sich mit diesem Material als Vulkanisierbestandteil für chlorierten Butylkautschuk und vergleicht es mit dem allgemein empfohlenen TMT/MBTS Vulkanisationsverfahren.

Entwicklungen in Organotin Stabilisiermitteln 669

Trotz des verhältnismässigen Rückgangs in USA, steigt die Weltproduktion von Organotin Stabilisiermitteln und sie hat gegenwärtig eine Menge von 1500 Tonnen jährlich erreicht.

Ein reges Interesse entwickelt sich in Europa für die ungiftigen Octylin Stabilisiermittel. Die Frage der Genehmigung des Giftigkeitsgrades wird derzeit erwogen.

Die wichtigsten Nachteile der Butyltin Stabilisiermittel beruhen auf Preis, Geruch und der Neigung zum Ankleben an die Walzen, Kalanderwalzen usw. Diese Probleme sind im Zuge der Lösung und es wird über den diesbezüglichen Fortschritt berichtet.

Neue Pulverdispersionen von Organotin Stabilisermitteln zwecks leichter Mischung in starren Massen sind eingeführt worden.

Es wird über die Wirtschaftlichkeit der Organotin-Stabilisierung berichtet und der gegenwärtige Stand des Kampfes zwischen Organotin Stabilisiermitteln und Barium-Cadmium - Stabilisiermitteln wird beschrieben.

Die künftige Entwicklung auf dem Gebiet der Stabilisermittel unter besonderer Berücksichtigung der Organotine wird skizziert und die ausserordentliche Produktionssteigerung der Organotin Stabilisiermittel in Japan wird besprochen.

Entwicklungen auf dem Kompoundierungssektor 671

Der Vortrag befasst sich mit der Verwendung eines chemischen Veredelungsmittels für Naturgummi/Styrol-Butadien-Kaustchuk und mit Entwicklungen, die in der richtigen Auswahl von Antiozoniermitteln für besondere Betriebsverhältnisse eingetreten sind.

In jüngster Zeit sind Arbeiten unternommen worden, die den Zweck haben, die Wirkung von Förderern, wie z.B. jenen, die in Butylkautschuk in Mischungen von Naturgummi/Styrol-Butadien-Kautschuk zu studieren. Durch die Verwendung von N, 4 - Dinitroso - N - Methylanilin können nun Verbindungen für Reifen aufgrund einer 50/50 Mischung hergestellt werden, die eine reduzierte Hysterese zeigt und daher eine reduzierte Wärmeentwicklung bei hoher Biegebeanspruchung. Diese verbesserte Eigenschaft ist bei Hochleistungsreifen von besonderem Wert, für die Styrol-Butadien-Kautschuk-Mischungen infolge ihrer zu hohen Wärmeentwicklung bisher nicht verwendet werden konnten.

Obgleich die Wirksamkeit von Antiozoniermitteln zum Zwecke der Verminderung von Rissen in Kautschuk nun allgemein anerkannt wird, ist doch die richtige Auswahl der besten verfügbaren Antiozoniermittel erforderlich. Die nunmehr zur Verfügung stehende Kenntnis ermöglicht es, jede Gruppe der Antiozoniermittel ihrem Werte nach zu beurteilen und mit voller Zuversicht die richtige Auswahl zu treffen. Kombinationen für Produkte, die statischer Belastung und einer ständigen dynamischen Beanspruchung unterworfen sind, werden gegenwärtig erwogen. Für Betriebsbedingungen, bei denen eine nur periodische dynamische Beanspruchung vorliegt, wie z.B. bei der Seitenwand von Reifen, ist eine Kombination von bestimmten Wachssorten, 6-Athoxy-2, 2, 4-Trimethyl-1, 2-Dihydrochinolin und N-Isopropyl-N'-Phenyl-p-Phenylen-Diamin als am erfolgreichsten befunden worden.

Fortschritte in der Tauchbeschichtung von Kunststoffen 674

Heisstauchbeschichtung in Kunststoffpulvern für Überzüge hat seit den späten 40er Jahren eine nützliche Alternative zur Einbrennmethode und anderen nichtglasartigen Überzügen geboten. Anfangs war Polthen das einzige, für dieses Verfahren verfügbare Material; trotzdem es jedoch noch immer seinen Platz als Überzug für allgemeine Verwendungszwecke behauptet, ist es nun nur eines der Reihe von Kunststoffpulvern, deren Einführung das für dieses Verfahren geeignete Gebiet bedeutend erweitert hat. Die neueren Pulver schliessen auch Zellulose-Azetat-Butyrat ein, das einen hochglänzenden Überzug gibt, sowie pvc und Nylon, die beide ausserordentlich zähe und haltbar sind. Einen wichtigen Zuwachs zu dieser Reihe stellt Epoxyharzpulver vor. Hand in Hand mit diesen Entwicklungen in Materialien sind Verbesserungen im Verfahren selbst erzielt worden, das jahrelang fast gänzlich auf Handbetrieb angewiesen war. Der erste Schritt zur Umwandlung des Prozesses auf die Basis einer Massenproduktion war die Anwendung des Wirbelprinzips für das Pulver, das das eigentliche Tauchstadium rascher und verlässlicher gestaltete. Derzeit wird eine neue Ausrüstung entwickelt mit dem Ziel einer schliesslich vollkommenen Mechanisierung des Verfahrens.

scomponete un edificio

e che cosa trovate?

materie plastiche dappertutto!

Il BREON PVC comme rivestimento per pavimenti e pareti, tendaggi e imbottiture, rivestimenti per griglie e cavi.

Lo STYRON al Polistirolo, sotto forma di piastrelle per pareti e sfiati per soffiitti, accessori elettrici e maniglie per porte.
Le resine poliesteri CELLOBOND come lucernari e lavandini, vasche di cacciata e W.C.

Il RIGIDEX al politene sotto forma di accessori elettrici, tubazioni, recipienti e utensili domestici.

L'EPOK, resina per rivestimenti, a volte solubile in acqua, che costituisce la base di vernici e pitture di tutti i generi.
Questi non sono che alcuni dei prodotti che il nostro dinamico gruppo di Società fornisce ai settori industriali di tutto il mondo.

Scriveteci oggi stesso per ulteriori particolari.

Breon, Styron, Cellobond, Epok sono marchi di fabbrica depositati.
Rigidex è un marchio depositato della British Hydrocarbon Chemicals Ltd. ed uno dei prodotti da essa fabbricati a Grangemouth.

British Geon Ltd	British Resin Products Ltd	Distrene Ltd	COMPANIES IN THE DISTILLERS PLASTICS GROUP

SEDE: DEVONSHIRE HOUSE · PICCADILLY · LONDRA W1 · INGHILTERRA

Sommari degli Articlo Principali

Gran Bretagna e le Mercato Comune 615

L'influenza diretta sulla gomma dell'entrata della Gran Bretagna nel Mercato Comune dovrebbe essere trascurabile. Nel caso di gomma naturale, le tariffe e le assegnazioni non hanno influenza sul modo col quale si svolgono le importazioni. Il Regno Unito impone un diritto generale del 10% sulla gomma sintetica; la sua entrata è già esente da diritti in tutti i paesi del mercato comune e non vi sarà una tariffa esterna comune. Per altro, l'abolizione del diritto del Regno Unito avrebbe poca influenza sull'industria britannica.

Indirettamente però il consumo di gomma del Regno Unito dovrebbe essere stimolato dalla nostra entrata nel mercato comune più grande se ciò significa—come forse potrà esserlo—uno sviluppo economico più rapido accompagnato da crescente domanda di manufatture di gomma. Le prospettive per quanto riguarda l'aumento delle nostre esportazioni di prodotti di gomma, come per esempio i copertoni, al mercato comune sono incoraggianti specialmente perchè le tariffe vigenti sono alte e l'industria fabbricante di gomma del Regno Unito è di concorrenza.

Le prospettive dei polimeri plastici sono incerte ma nel-l'insieme, buone. Le tariffe del Regno Unito sui più importanti prodotti termo-plastici non sono eccezionalmente alte ma i fabbricanti dovranno affrontare una concorrenza crescente da parte di produttori europei con capacità in eccesso di domanda. Conunque, i fabbricanti di plastica del Regno Unito formano parte di una grande ed efficiente organizzazione e dovrebbero poter per lo meno mantenersi, sebbene specialmente nel caso dei polimeri pvc può essere difficile evitare un aumento di importazioni.

Il Prezzo della Schiuma 656

Si sono esaminate le conseguenze tecniche della sostituzione nella spuma di lattice naturale con sintetico, nonchè in modo speciale la premessa che quando il prezzo della gomma naturale è più alto di quello della sintetica, un maggior uso della sintetica debba portare ad un risparmio nel costo di produzione. Si arriva alla conclusione che entro una gamma probabile di variazioni di prezzo l'economia apparente derivante dalla sostituzione nella spuma di lattice naturale con sintetico è in gran parte illusoria.

Rassegna Dell'industria Britannica di Macchine per Stampaggio ad Iniezione 659

Lo sviluppo dell'industria britannica delle macchine per la plastica è stato rapido durante gli ultimi cinque anni. I fabbricanti di macchine ad iniezione si sono trovati all'avanguardia di questo sviluppo e attualmente vi sono non meno di trenta fabbricanti o fornitori.

Sebbene un certo numero di aziende fabbrichi tuttavia macchine di tipo a stantuffo normale soltanto, la maggioranza impeiga delle tecniche preplastificanti in una forma o nell'altra. Vi sono preplastificanti a vite 'in linea' e viti e stantuffi ausiliari. Si descrivono per intero i vantaggi delle migliori caratteristiche di fusione date da queste tecniche e si fa un confronto fra i vari methodi.

La tecnica dello stampaggio ad iniezione vien discussa in generale e la si raffronta con le realizzazioni britanniche e le attrezzature qui disponibili. Si esaminano i procedimenti moderni di stampaggio ad iniezione in modo da portare in vista i vantaggi delle macchine britanniche. Si dà un catalogo di quasi tutti i fabbricanti britannici con indicazione del tipo di macchina costruito da ciascuno di essi. Tanto le ditte britanniche come quelle che producono o distribuiscono macchine per costruttori dell'Europa contintentale e degli Stati Uniti sono anche incluse, in modo da dare cosi un quadro completo dell'industria.

La Vulcanizzazione Ditiolica nel Butil Clorurato 666

La gomma butil clorurata può essere vulcanizzata in base ad una gamma molto più ampia di sistemi di vulcanizzazione di quella relativa al butil non alogenato. Fra i molti agenti vulcanizzanti che possono essere impeigati con il clorobutil, i ditioli stanno creando notevole interesse dato che producono composti di rapida vulcanizzazione con alto modulo, bassa presa di compressione e buone proprietà di flessione. L'acetato di-mercapto glicolico può essere ora ottenuto da due fabbricanti del Regno Unito ed è l'unico ditiolo avente applicazione practica attualmente.

L'articoco esamina questo materiale quale ingrediente vulcanizzante per la gomma butil clorurata, raffrontandolo con il sistema di vulcanizzazione TMT/MBTS generalmente raccomandato. Esso permette al clorobutil di essere vulcanizzato in modo da dare un composto elastico e resiliente e tali composti trovano impiego in applicazioni nelle quali si richiedono le utili proprietà che in generale si riscontrano nel butil, nonchè l'alto modulo e il rapido ricupero dalla caratteristica di deformazione di questo sistema di vulcanizzazione.

Sviluppi in Materia di Stabilizzatori Organotin 669

Nonostante la riduzione relativa nella produzione degli Stati Uniti, la produzione mondiale di stabilizzatori organotin va aumentando ed è prossima ora alla cifra di 1500 tonnellate annuali.

Grande interesse si va manifestando in Europa negli stabilizzatori octiltin non tossici.

La questione dell'approvazione della tossicità viene discussa.

I difetti principali degli stabilizzatori butiltin sono il prezzo, l'odore e la tendenza ad attaccarsi ai rulli di frantumatrici e calandre ecc. Questi problemi si vanno risolvendo e si passa in rassegna il progresso in questo campo.

Si sono introdotte nuove dispersioni in polvere di stabilizzatori organotin per la facile mescolazione in composti rigidi. L'economia della stabilizzazione organotin viene passata in rassegna e si describe lo stato presente della battaglia fra stabilizzatori organotin e stabilizzatori al bariocadmio.

Si prospetta il corso futuro del progresso nel campo degli stabilizzatori con riferimento particolare agli organotin e si discute lo sviluppo straordinario degli stabilizzatori organotin nel Giappone.

Sviluppi in Materia di Composti 671

Questa memoria tratta dell'uso di un agente modificante chimico per la gomma naturale/SBR e degli sviluppi che hanno avuto luogo nella scelta debita di antiozonanti per specifiche condizioni di servizio. Si far riferimento speciale ai copertoni.

Recentemente si sono effettuati degli studi sugli effetti dei promotori tali quali quelli usat nella gomma butilica di miscele di gomma naturale/SBR. Mediante l'uso della N, 4-dinitroso-N-metilanilina si possono ora produrre materiali per copertoni basati su una miscela 50-50 che presentano una isteresi minore e quindi minore formazione di calore in condizioni di flessione severe. Queste migliori carette-ristiche sono specialmente utili per i copertoni di tipo pesante nei quali le caratteristiche di formazione di maggior calore dei composti a base di SBR ne hanno impedito l'impiego.

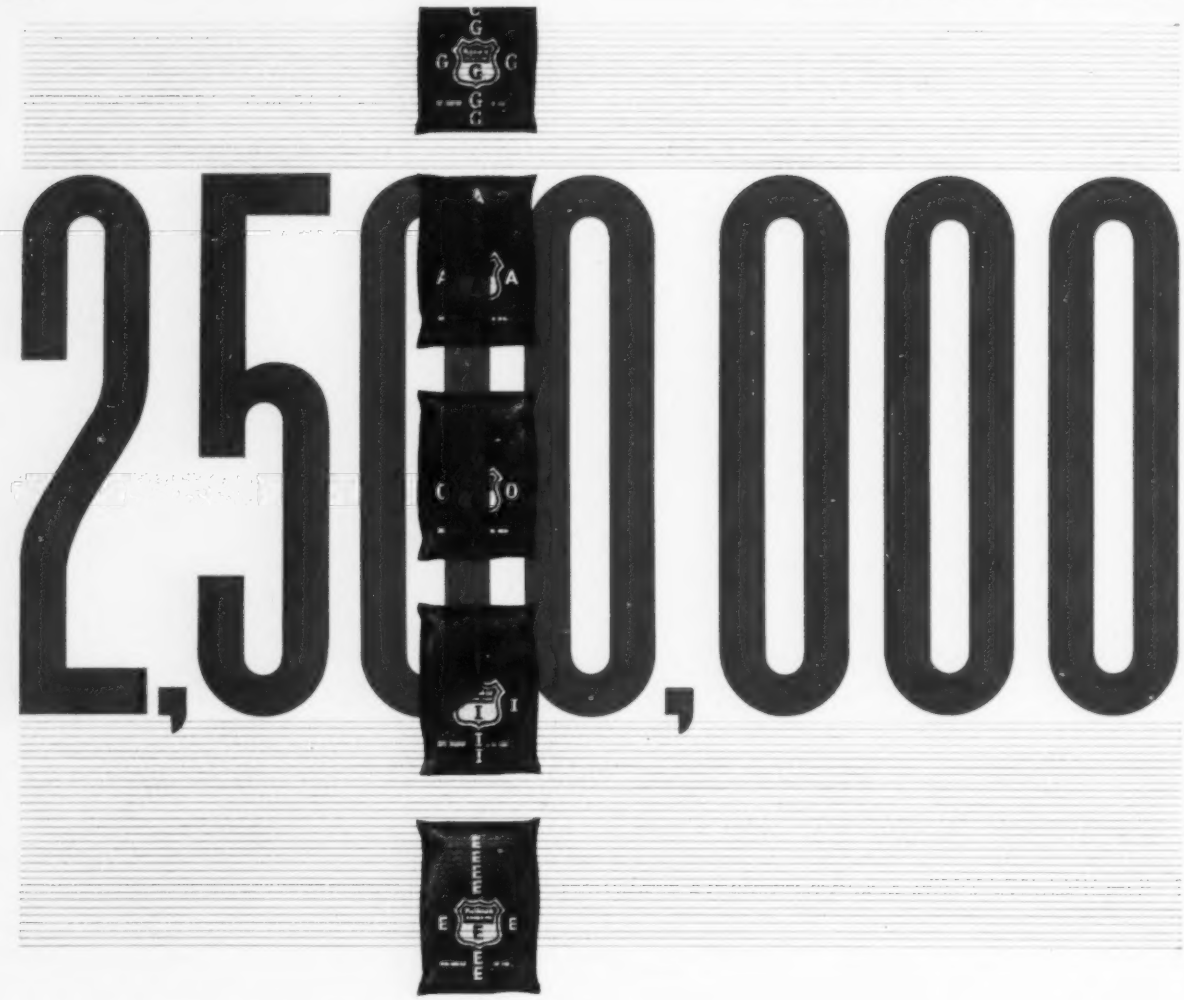
La miscelazione segue lo stesso procedimento che già si usa per la miscelazione al nerofumo nei mescolatori interni.

Sebbene si apprezzi ora in ampia misura l'efficacia degli antiozonanti per ridurre lo sviluppo del cracking nella gomma, la scelta appropriata dei migliori antiozonanti disponibili è essenziale. Secondo le informazioni che esistono attualmente ciascuna classe di antiozonanti può essere tenuta in considerazione a seconda dei vantaggi offerti e la scelta appropriata può essere fatta con piena fiducia. Si considerano combinazioni per prodotti che subiscono sforzi statici e soggetti a sollecitazioni di flessione dinamica continua. Per condizioni di servizio dinamico intermittente, come nel caso dei fianchi dei copertoni, si è trovato che una combinazione di cera scelta, 6-etossi-2, 2, 4-trimetil-1, 2-deidrochinolina ed N-isopropil-N′ -fenil-p-fenilene diamina dà i migliori risultati. Questa combinazione particolare è stata riscontrata essere efficace sia nella gomma SBR che in quella naturale.

Progresso nel Rivestimento ad Immersione con Materie Plastiche 674

Il rivestimento ad immersione calda in polveri plastiche ha costituito, sin dalla fine del decennio 1940-1950, una variante utile dello smalto a fuoco e di altre finiture non vitree. In un primo tempo, il politene fu l'unico materiale disponibile per la lavorazione, ma sebbene esso mantenga il suo posto quale mezzo di rivestimento a scopi generali, esso è ora soltanto uno di una gamma di polveri plastiche la cui introduzione ha notevolmente aumentato il campo del metodo. Le polveri più recenti includono cab che dà una finitura ad alto brillo e pvc e nylon, che sono ambedue molto resistenti e durevoli. Un'aggiunta recente importante è costituita dalla polvere di resina epossica.

Allo stesso tempo dello sviluppo nei materiali si sono verificati progressi nel processo stesso che per degli anni è stato quasi interamente un'operazione a mano. Il primo passo inteso a mettere il processo sulla base di lavoro in serie è stata l'applicazione del principio di fluidizzazione alla polvere, il che ha fatto si che lo stadio d'immersione fosse più rapido e desse maggior assegnamento. Attualmente, si stanno perfezionando nuove attrezzature, quali per esempio sistemi di riscaldamento e d'immersione convogliati allo scopo di meccanizzare per completo la lavorazione.



It takes 2,500,000 50lb. bags to hold the 125,000,000 pounds of carbon black which can be produced yearly by PHILBLACK LIMITED at their all-British plant at Avonmouth. These 2 cu.ft. bags allow fast, clean, low-cost transport and storage.

BRITISH PHILBLACK*

PHILBLACK LIMITED
1 Henbury Rd., Westbury-on-Trym, Bristol
Tel: Bristol 62-1321
Works: Severn Rd., Avonmouth

Sole Sales Representatives:
R. W. GREEFF & CO. LTD.
Garrard House, 31-45 Gresham St.
London, E.C.2
Tel: MONarch 1066
Telex No: 22698
Advisory Service: Hambridge Lane,
Newbury, Berks. Tel: 1643

* *This is a trade mark and Philblack Limited is a registered user.*

NOTES of the WEEK

Export Focus

THIS issue, our annual export number, marks a year of the utmost importance in the UK economy. It is a year which has seen two budgets; a year in which Britain has officially applied for membership of the Common Market. This special issue is arranged so that both UK readers and overseas importers can bring these matters into focus. If Britain does join the Common Market then it will obviously have a profound effect on this country and on the Commonwealth and Europe. We asked the Economist Intelligence Unit to predict the effect so far as the rubber and plastics industries are concerned. Their findings appear on page 615. This is the first survey of its kind, covering rubber and plastics, since the UK applied to join the Six in August.

The export section (pages 627 to 655) contains illustrations and descriptions of the products of the UK rubber and plastics industries. We are very grateful to all manufacturers who co-operated in supplying details of their products.

Summaries of the principal articles in this issue — which include a detailed study of the UK injection moulding machine field, a paper on chlorobutyl rubber and an analysis of the cost factor in producing foam from blends of synthetic rubber and natural rubber will be found on page 597.

Regards vers l'exportation

CE numéro, qui est notre numéro exportation annuel, marqué une année de la plus haute importance dans l'économie anglaise. C'est une année où l'on a vu deux budgets, une année au cours de laquelle la Grande-Bretagne a fait sa demande officielle de membre du Marché Commun. Ce numéro spécial est prévu de telle sorte que à la fois les lecteurs du Royaume-Uni et les importateurs de l'étranger puissent concentrer leurs regards sur ces questions. Si la Grande-Bretagne entre dans le Marché Commun, cela aura de toute évidence le plus profond effet sur notre pays, sur le Commonwealth et sur l'Europe. Nous avons demandé au Groupe d'Information de l'Economist de prédire les effets en ce qui concerne les industries du caoutchouc et des plastiques. Le résultat figure aux page 615. C'est la première enquête de ce genre qui concerne le caoutchouc et les plastiques depuis que la Grande-Bretagne a demandé à se joindre aux Six en août.

La section exportation (pages 627 à 655) contient des illustrations et descriptions des produits des industries du caoutchouc et des plastiques de la Grande-Bretagne.

On trouvera à la page 599 des résumés des principaux articles paraissant dans ce numéro, notamment une étude détaillée du domaine des machines de moulage par injection dans le Royaume-Uni, un exposé sur le caoutchouc chlorobutyle et une analyse du facteur prix de revient dans la production de la mousse à partir de mélanges caoutchoucs synthétique/naturel.

Punto focale d'esportazione

QUESTO numero, che è il nostro numero di esportazione annuale, contrassegna un anno della massima importanza per l'economia del Regno Unito. È un anno che ha visto due bilanci e l'anno nel quale la Gran Bretagna ha fatto richiesta ufficiale di ammissione al Mercato Comune. Questo numero speciale è disposto in modo che sia i lettori del Regno Unito che gli importatori all'estero possano portare queste questioni al punto focale. Se la Gran Bretagna viene a far parte del Mercato Comune ciò indubbiamente dovrà avere un profondo effetto su questo paese, sul Commonwealth e sull'Europa. Noi chiedemmo al Gruppo Studi dell'Economist di predire l'effetto per quanto concerne le industrie della gomma e della plastica. I risultati delle loro ricerche sono dati a pagina 615. Questa è la prima ricerca del suo genere, circa la gomma e le materie plastiche, da quando il Regno Unito chiese di associarsi ai sei nell'Agosto scorso.

La sezione esportazione (pagine 627 a 655) contiene illustrazioni e descrizioni dei prodotti delle industrie della gomma e delle materie plastiche nel Regno Unito.

A pagina 603 si troveranno sommari dei principali articoli di questo numero — che comprendono uno studio particolareggiato del settore presse ad iniezione per materie plastiche del Regno Unito, una memoria circa la gomma clorobutilica e sull'analisi del-l'elemento di costo per produrre schiuma da miscele sintetiche/naturali.

Augenmerk auf Export

DIESE Ausgabe, unsere alljährliche Exportnummer befasst sich mit einem Jahr grösster Bedeutung für die britische Wirtschaft. Es ist dies ein Jahr, in dem wir zwei Budgets erlebt haben; ein Jahr, in dem Grossbritannien offiziell um die Aufnahme als Mitglied des Gemeinsamen Marktes angesucht hat. Diese Sonderausgabe ist so abgefasst worden, dass diese Fragen sowohl für britische Leser als auch für ausländische Importeure in den Brennpunkt des Interesses gerückt werden. Wenn Grossbritannien dem Gemeinsamen Markt beitritt, wird dies ohne Zweifel einen bedeutenden Einfluss auf Grossbritannien, die Länder des Commonwealth, sowie Europa ausüben. Wir baten die Economist Intelligence Unit (Prüfungsgruppe für Wirtschaftsfragen) um ihre Ansicht über diese Auswirkungen, soweit sie die Kautschuk- und Kunststoffindustrie betrifft. Die Antwort erscheint auf Seite 615. Dies ist die erste Ubersicht dieser Art über die Kautschuk- und Kunststoffindustrie, seitdem Grossbritannien im August um Aufnahme als Mitglied des Gemeinsamen Marktes angesucht hat.

Der Exportteil (Seiten 627 bis 655) enthält Abbildungen und Beschreibungen der Produkte der britischen Kautschuk- und Kunststoffindustrie.

Auszüge der wichtigen Artikel dieser Ausgabe mit einer genauen Studie des britischen Spritzgussmaschinensektors, eines Referates über Chlorbutylkautschuk und eine Kostenanalyse der Erzeugung von Schaumgummi aus einer Mischung synthetischen und natürlichen Kautschuks sind auf Seite 601 abgedruckt.

NEWS *Briefs*

POLYTHENE PLANT FOR E. GERMANY?—CEYLON RUBBER SUBSIDY — NEW JAPANESE PVC RESIN ARGENTINA'S $72m. PETROCHEMICAL COMPLEX

●**France** — Lightnin' Mixers Ltd. of Poynton, Cheshire, has received an order valued at £75,000 for the supply of fluid mixers to the Polymer Corporation. These mixer units will provide the main mixing requirement for the new plant which the Corporation is setting up at Strasbourg and are expected to be delivered during the early part of 1962.

●**East Germany** — Two official representatives in the UK of the Chamber of Foreign Trade of the German Democratic Republic recently visited the Cheadle Heath, Stockport, headquarters of Simon-Carves Ltd. They were particularly interested in the capacity of the company for contracting for the building of a projected complete polythene plant at Leuna.

●**United States** — The recent slowdown in General Motors Corporation car output has affected the US Rubber Co. and it now seems clear that its 1961 income will fall short of the $4.44 per share of 1960. Keen competition in the replacement tyre market as well as competition from imported rubber footwear, are additional contributory factors.

●**Indonesia** — Estate production of rubber in Central Java has declined considerably this year, according to a spokesman for the Provincial Plantation Service. No figures have been quoted but the main trouble is reported to be that trees are getting too old. About half the plantation trees in Central Java are past their best. To encourage higher standards, the Government will pay a premium of 16,000 rupiahs per hectare to every estate over 25 hectares which produces high grade rubber.

●**Japan** — An unplasticized pvc resin with high softening point and which is suitable for films and for injection moulding has been developed by Mitsui Chemical Co. Ltd. Commercial production at an initial rate of 400 tons a month is due to start early next year at the company's Nagoya plant.

●**Ceylon** — On representations made by the Rubber Controller, the Government of Ceylon has decided to extend the rubber replanting subsidy scheme until 1968. The scheme, introduced in 1953 would normally have ended next year. Since it started some 151,000 acres of rubber have been replanted with high-yielding strains.

●**United States** — Recognizing the importance of retreading to motorists and tyre dealers, The Firestone Tire and Rubber Co. has introduced a layer of red rubber between the tread and cord body in two-ply tyres. The red safety shield serves as a warning to motorists that their tyres have reached the danger point. It also serves as a guide to the retreader to prevent tyre damage during the buffing operations. Firestone has produced two-ply tyres as original equipment for some of this year's compact models and is producing them for the 1962 model standard size cars as well.

●**Argentina** — Financial arrangements have been completed for an important part of the $72m. petrochemical industry to be built in Argentina to supply that country's major needs for synthetic rubber, benzene and chemical intermediates which are now largely imported. This has been announced by Harold G. Osborn, chairman of the board of Pasa, Petroquimica Argentina SA. The project is expected to involve the largest investment of private capital ever made in a new South American industrial project. Preliminary plans for the project were announced last January by the five US firms that are sponsoring Pasa and will initially own all its stock — Continental Oil Co., Cities Service Co., United States Rubber Co., Fish International Corp. and Witco Chemical Co. The Pasa plant, which is to be built at San Lorenzo, is to include a catalytic reformer and units to make benzene, styrene, butadiene, SBR, *cis*-polybutadiene, and intermediate products including carbon black. Net savings in foreign exchange are expected to amount to about $29m. a year.

●**India** — The third plan target for the production of natural rubber in India has been fixed at 45,000 tons a year — a 70% increase over previous years. At the 40th meeting of the Rubber Board in Kottayam, Kerala, it was announced that the construction of the rubber research laboratory at Puthapally had been completed and that work there would commence during April 1962.

●**Argentina** — A plant has recently been opened at Pilar by the Borden Chemical Co. Major products will be formaldehyde, of which the annual output will be 13m. lb. and synthetic resins (6.6m. lb.).

— 559

Quick Recovery from Fire

KAY'S NEW MILLS FACTORY ALMOST TOTALLY DESTROYED

WITHIN a fortnight of an extensive fire at Kay Brothers Plastics Ltd.'s New Mills, Derbyshire, factory, the company expects the works to be back in full production. This was announced on Friday (October 13).

The fire broke out on October 11 and swept through the four-storey factory, destroying stocks of plastics foam and converting equipment valued at nearly £100,000.

The premises, which have been almost totally destroyed, are five miles from Kay's main premises at Marple, Cheshire, and were used for storing and converting plastics foam. The main foaming plant is at Marple, so that the actual production of foam will not be affected.

Foamback Machinery Lost

What has been lost is practically all the plant used for cutting, profiling and generally fabricating the foam. This includes expensive machinery for making foambacks recently flown in from America.

The fire broke out in the foam store on the third floor of the building. The premises were cleared of the 150 employees within two minutes and no one was injured, but thick smoke and fumes drove back the works fire team and blew out windows.

Ten brigades fought the fire all day but practically nothing could be saved. Among the few items salvaged, however, are valuable templates and drawings which would have been virtually impossible to replace.

D. B. Smith, managing director, called an immediate conference and arrangements were made to operate all the equipment at Marple at full capacity 24 hours a day until further notice. Even tea breaks and meal times are being staggered. None of the employees at New Mills will lose his or her job; everyone is being transferred to Marple where some band-knives and other equipment have already arrived.

J. E. Player, chairman of the company (which is a member of the Reckitt and Colman Group) arrived at New Mills on the night of the fire for on-the-spot discussions. The cause of the fire is still unknown.

The New Mills premises, formerly a cotton doubling mill, were rented and had been used by Kays since December. Work there was going on at full capacity as Kay's output so far this year is nearly one-third up on last year.

Converting Capacity Reduced

The firm estimates that the fire has taken away five-sixths of its converting capacity and, although relatively simple products such as cushions will be back in large-scale production within days, more specialized work may be affected for several weeks.

'We have had wonderful offers of help from our friends in the trade', said Mr John Webb, director of the firm, 'and kind messages have been pouring in from our customers. Although we know we have their goodwill we shall spare no effort or expense in meeting delivery dates as soon as possible'.

Easier Colour Matching

BIP Chemicals has produced a new range of colour discs for moulders to make colour matching more accurate and simple. The new discs have two thickness levels, since thickness affects the colour of translucent and semi-translucent shades. The discs have softly rounded edges, but there is one straight edge which can be held closely against any straight edge of the object being matched.

Acrylic Price Cut

I.C.I. has increased its manufacturing capacity for Perspex acrylic sheet. The company says that further extensions over the next year will result in a total capacity in excess of 20,000 tons.

In anticipation of reduced costs arising from increased standardization and productivity, the price was reduced on Monday (October 16), by an average of 2%. Incentives are to be given for purchases of standard-sized sheet and orders in quantity.

I.C.I. adds that 'further significant reductions in cost are expected over the next two or three years'.

ASTM Changes Name

The name of the American Society for Testing Materials has been officially changed to the American Society for Testing *and* Materials.

In announcing this change, ASTM president Miles N. Clair said: 'The inclusion of the word "and" in the Society's name places added emphasis on the Society's research work in seeking knowledge of the nature of materials'.

Formica Prize

At the recent 1961 Minibition of the Purchasing Officers Association, Formica took a joint second prize in a competition for the best stands from the display angle. The judge was Paul Reilly, director of the Council of Industrial Design.

Compact Latex Dipping Machine

FINAL speed checks are being carried out on a new version of the Cotswold Mark VIIR controlled-extraction latex dipping machine at the works of the manufacturers, Lionel Hook and Sons Ltd., Stroud, Gloucestershire.

The machine has been specially modified to provide a complete yet compact production unit. It accommodates a stainless steel circulating tank for the latex as well as a plain stainless coagulant tank. A lightweight wheeled trolley, with capacity for a batch of formers 2ft. 3in. by 1ft. 6in., can be moved along guide rails over either tank for successive dips as required.

Ball Races

The complete rail assembly carrying the trolley is mounted on 32 ball races and moves up and down circular guide bars under the control of a very sensitive hydraulic unit. Speeds of immersion and withdrawal are infinitely variable down to as little as $\frac{1}{16}$in. a min.

Fixed extension rails can be fitted to mate with the 'at rest' position of the mobile rail assembly so that the trolley can be moved in and out of the machine if required.

The inner frame of the trolley can be rotated or inverted as necessary and is fitted with roller guides into which individual (or batches) of former bars can be inserted.

The Stroud firm is said to be the only one in the UK specializing solely in controlled-extraction pvc and latex dipping and control dip finishing machines. It is building up a considerable export demand for its machinery.

194 for 1962

Storeys of Lancaster — the biggest manufacturer of printed pvc in Europe — introduced its 1962 designs in London last week.

There are 194 designs, and the emphasis is on smaller patterns more suitable for making up than for curtaining.

VIEWS and REVIEWS

Nothing But The Truth

THERE is a persistent, popular belief that science and scientists are characterized by extreme precision and accuracy. It is a misapprehension.

Near Enough is Good Enough

It arises perhaps from the rigour of the logic of science and the extensive use of mathematics (which is popularly supposed to be an exact discipline whereas much of it is now based on the premise that exactness is impossible anyway). It should be a first duty of all teachers of science to stress that practicality and simplicity come first and that, therefore, approximation is a scientific virtue.

There are basic reasons for this, some residing in the philosophy of science. For instance, Occam's Razor is a well-known tenet of scientific hypothesizing. Prefer the simpler explanation.

There are also reasons of expediency, one of the most compelling being that accuracy costs money and there is no need to buy more of it than we really need.

For instance, if you have a square box to fill with round bottles, you do not need to know the value of π to many decimal places, though such accuracy would become necessary if you were setting out to calculate the viscosity of an oil emulsion of a given concentration.

What are the limits of sensitivity needed in practical numerical problems? How many decimal places do I want? What is 'precision'? What is an accurate measurement?

A Superfluity of Penguins

Most of us are interested in these problems to some degree or in some aspects. We can read all about it in the four papers and a discussion which were reported in *Materials Research and Standards*, April 1961, Vol. 1, No. 4, pp. 264-277. The subject is there treated exhaustively, not to say exhaustingly, giving point to the delightful story told in the editorial of the same journal, 'about the little girl who was asked for her opinion of a book about penguins that someone had given her. Quite soberly, she replied: "This is a very good book, but it tells me more about penguins than I want to know".'

Here indeed is an example of the sort of work calling for the professional interpreter and expositor I was writing about the other day. I found the discussion to be the most readily understandable part of the whole, and I think I can give some idea of the central problem by quoting from it.

Precision and Accuracy

'A marksman whose shots bunch together tightly, but are all to the right and below the bulls-eye, has one problem, and the man whose centre of gravity is pretty close to the bulls-eye but whose shots are dispersed widely has another problem, and the man who has some of both has to cope with both of these problems'.

I understand it to be the position of the ASTM committee that it calls the first of these problems 'bias' or 'systematic error', and the second 'precision', but thinks that 'accuracy' may be either or both of them.

This being disposed of, the discussion produced some interesting remarks on the question I began with.

Numbers Rough and Round

'. . . Almost all men are two metres high to the nearest metre, and with this information you lose all information about the variability of men's heights. This is one of the commonest errors — to throw good information away thinking there is nothing there'. (W. J. Youden.)

'I am more appalled at my friend who is measuring low-temperature responses, down to about 2K, where the best he can get are three meaningful digits; but at higher temperatures he starts to get four, and at a little higher temperature he gets five, so he very carefully plots the data on the finest graph paper he can get, draws in a smooth curve, and hands me the derived data all with five fancy digits . . .' (Milton Terry.)

'A group of chemists . . . conducted a round robin on a new method for the measurement of inorganic chlorides . . . we wanted to know how *finely* we could measure — how many figures to the right of the decimal point'. As the test was a titration, there was a calculation, and, of course, it could be carried out to any number of figures.

'When the calculations were carried out to three decimal places (thousandths of a part per million) the result of the experiment looked quite hopeless and discouraging. Rounded off to hundredths, they became a very nice set of figures, susceptible to ordinary methods of analysis. If the results are rounded off to tenths, then, as Mr Youden mentioned, you lose all the variations. It looks as though the data are telling me that the calculation should be carried out to hundredths.

'I had this problem and this is the way I solved it. I am not familiar with any discussion of this problem in the books that I have read'. (George Shombert, Jun.)

Milton Terry himself did not know of anything written on this subject, and added a related illustration of his own: 'There is also a very real problem that comes when one starts multiplying the original measurement by some constant correct to many decimal places. Now life becomes incredibly difficult. We have had this problem in measuring relays and the rebounds thereof where the measurements are the number of lines on an oscilloscope that is crossed by a pip. Then this is multiplied by 0.013476, say, and reported as mils of rebound. I defy any statistician to come up with a reasonable answer based only on the garbage that this produces. Whereas if you have the original number of lines crossed, you can make a great deal of sense out of the data'.

Comparing Mixers

A fundamental technique and technology of our industry consists in the blending of one substance with another. Generally, into the basic polymer we mix the substance required to produce the effect or effects we want, be it only to introduce a filler.

We use a variety of mixers. Two of them are evaluated and compared for the production of silicone rubber mixes, by Liermann and Miller in *I/EC* for September 1961, Vol. 53, No. 9, pp. 702-4.

For silicone rubbers, the rubber industry's standard, two-roll, water-cooled mill is well suited. The silicone rubber usually goes to the fast roll which is equipped

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

with a scraper because some of the mixes have a low strength.

Standard dough-mixers, medium to heavy duty, can also be used. The jacket and/or the blades are equipped for heating and cooling, and, to minimize contamination, stainless steel is the usual constructional material.

Installation Costs

Floor space requirements per lb. are about the same for both mixers. Equipment costs differ strikingly. For equivalent outputs, dough mixers are considerably more expensive than rubber mills, and this difference increases as the size of the equipment is increased. Total installed cost of the two also gives the same result.

Energy Requirements

The mixing energy requirements of the two are that the horsepower required per moment per lb. on the two-roll mill is some fifteen times as much as on the dough mixer, but, as dough mixing takes over twelve times as long, the total energy required, in hp per hour per lb. is nearly the same. The dough mixer batch being ten to twenty times greater than that from the roll mill is, for several reasons, more uniform.

The authors find it difficult to make actual comparisons of labour costs but they confidently generalize that dough mixers offer the greater possibiiity of cost reduction.

Their final summary of the overriding differences is: '. . . mills offer higher output per investment dollar; dough mixers give greater product uniformity; and dough mixers promote greater versatility'. But, I would have liked them to have investigated further a point they make earlier in the paper in these words: 'Not to be overlooked is the inherent ability of the rubber mill to be converted to a continuous operation either by itself or in tandem with another mill. Obviously, the conversion to continuous operation can also minimize the batch mill run variations . . . '

Compounding Survey

That is a paper devoted to a specific and specialized aspect of compounding a speciality rubber. In *Rubber Age*, Vol. 89, No. 5, August 1961, pp. 791-9, I. Drogin gives an excellent general survey of rubber compounding under the title: 'Incorporation and Dispersion of Compounding Ingredients'.

He weaves his remarks around the question: 'How should one proceed to incorporate compounding ingredients in various rubbers and achieve a satisfactory degree of dispersion?' He concludes: 'The raw materials required and the end-product itself jointly determine the degree of dispersion required to achieve an optimum balance between quality and cost'.

The paper can be regarded as summarized by its three long tables. I.—Materials involved in incorporation and dispersion of ingredients. II.—Factors influencing incorporation and dispersion of ingredients. III.—Banbury procedures for dry mixing various types of stocks.

More New Rubbers

Such are the exigencies of time, writing, publishing, and transport that the ACS Rubber Division's 80th meeting will be well over before these remarks appear, although I have so far seen only its projected programme. Well over, but not forgotten, if only for its own witness to the truth of a statement in one of its papers.

John McGavack, in an unusual paper on 'The Distribution of Rubber Literature', reports that he has been counting the number of rubber references in order to tabulate the growth of rubber literature and 'to determine whether the United States is maintaining leadership in this field'. This is a good, new idea. What a pity the quality cannot be measured as easily as the quantity.

He has discovered that 'the largest growth rate of 680% for 1941-59 appears in the subject of Rubberlike Plastics. For the same period, references to Synthetic Rubber increased 178%.'.

I do not know the fine distinction which separates a Rubberlike Plastic from a Synthetic Rubber, but, no doubt, they will still constitute the largest group if we lump them together as elastomers. The ACS itself appears to do this as this meeting included a symposium on 'Elastomers from Petroleum Hydrocarbons' (although it would require an elastic definition to include balata — the subject of one of the papers).

The ethylene-propylene copolymers were dealt with in a variety of ways; chlorobutyl rubber and chlorinated ethylene-propylene are well into the processing stages; vinyl pyridine rubber reacted with an inorganic halide has produced 'a compound which has hysteresis properties like a carcass stock and abrasion resistance like a tread stock'; du Pont announced a new sulphur-curable elastomer derived from olefins and diolefins.

Sparks from Natta

The recent award of the International Synthetic Rubber Gold Medal to Professor Guilo Natta provides me with an appropriate reason for mentioning the work of that great man.

One of the recent additions to the Reinhold Plastics Application Series is a useful little book — *Polypropylene* — by Theodore O. J. Kresser.

'Natta's work on isotactic polypropylene', he writes, 'sparked a volume of research on polymerization never before approached. Within a short time the technical literature was full of endless examples of stereospecific polymerization. . . . Curiously enough some of the most startling and perhaps, in the long run, most valuable consequences of this work resulted not in polypropylene but in improved synthetic rubbers'.

Just how far-reaching this development will be remains to be seen, but without doubt the name of Natta will go down to posterity as one who has made a most significant contribution to our knowledge of polymer technology.

An Expensive Footnote

At the time when our own Institute of Directors is issuing advice about expenses, the Bill before the US Congress to limit expense spending, though not likely to be passed for a long time, is already having an effect. According to the *Rubber Age*, some companies are 'telling their employees to curtail travel and entertainment expenses . . . to hold to the limits on hotels and meals embodied in the Administration's Bill — $30 a day. The hold-downs are being extended to lavish entertainment of customers and many restaurants are already complaining'.

And not only the restaurants, I imagine.

CHARLES JENNINGS

Export Tours of Europe

TEN COUNTRY COVERAGE BY ABRASIVE DEVELOPMENTS

TWO novel approaches to export marketing in Europe are being made by polymer firms.

This week a manufacturer and his supplier, Vitafoam Ltd. and the International Synthetic Rubber Co. Ltd., completed an exhibition tour of Denmark.

The other venture concerns Abrasive Developments Ltd. This firm is to take a demonstration vehicle on an extensive continental tour, starting on October 30.

The Vitafoam/ISR exhibition consists of two units related to each company; they are co-ordinated in design so that they can be staged jointly or separately. The joint exhibition had its premiere at the Mercur Hotel, Copenhagen.

Vitafoam introduced its latex foam mouldings and bedding, rubber carpet underlay, solid rubber upholstery webbing, reinforced plastics chair shells and pvc foam to the upholstery and transport industries, and to the contract and retail furnishing trade in Denmark.

Door to Door

ISR supported Vitafoam — one of its leading customers for synthetic latex — and also offered solid synthetic rubber to Danish industry for a wide range of applications.

The exhibitions, which pack flat for transport, are based on a combination of blown-up photographs and samples, and can be set up quickly without skilled labour.

A special van took the exhibit from door to door via the Harwich-Esjberg vehicle ferry.

Peter V. Crofts and Norman Weymouth, publicity managers of Vitafoam and ISR respectively, handled the whole operation.

The Abrasive Developments tour will cover Germany, France, Belgium, Holland, Italy, Spain and the Scandinavian countries over a period of 12 months.

A complete demonstration room is housed in the vehicle that will make the tour. Two of the company's standard machines are situated in the rear of the vehicle, one for the cleaning and polishing of rubber moulds, the other for the preparation of metal surfaces prior to rubber or plastics bonding.

Under the floor is a compressor for supplying air to these machines, a water storage tank and fuel tanks.

An electrically-controlled drum feeds out 160ft. of cable for connecting up to power supplies.

The vehicle has central heating, air conditioning — and even a cocktail bar. A front compartment is fitted out as a small cinema.

The operation is controlled by a permanent staff of three: a driver/demonstrator, a company executive, and the agent of the area in which the vehicle is travelling.

The first demonstration will be given at Aachen, Germany.

The ISR/Vitafoam exhibition leaving for Denmark—Norman Weymouth, publicity manager of ISR *(left)* **and Peter Crofts, publicity manager of Vitafoam**

Tridecanol for Plasticizers

Tridecanol has been added to the sales range of I.C.I.'s Heavy Organic Chemicals Division. Consisting of a mixture of branched-chain C_{13} primary alcohols, tridecanol is mainly used in the manufacture of plasticizers, detergents, and oil viscosity-index improvers.

As a plasticizer alcohol, tridecanol is esterified to ditridecyl phthalate which, having a high molecular weight, is a low-cost replacement for polymeric plasticizers in specialized applications where properties such as low volatility and low migration are important.

Sto-Chem Forms Sales Division

Sto-Chem Ltd. has recently announced the formation of its own Sales Division. The sales control office will be located alongside the Technical Service laboratories and production facilities at Stoke Works, near Bromsgrove, Worcestershire.

Witco Chemical Co. Ltd., who, by arrangement with Sto-Chem sponsored the initial sales development, will be relinquishing its distributorship of Naugatex and Nitrex synthetic latices, in view of the Sto-Chem plant coming on stream at the end of this year.

Abrasive Development's demonstration vehicle—ready for a year's tour of ten European countries

MEN *and* MATTERS

A Review of People and Events

by Peter Richards

ONE of the biggest complaints against UK exporters is simply that they do not go out for the business. Our executives tend to be far too desk-bound, some continental critics tell us.

Not all of them, however. Some firms are packing up their products and taking them out on the European road. The International Synthetic Rubber Co. Ltd., and Vitafoam Ltd., took a travelling exhibition to Denmark the other week, a special van making the door-to-door journey by the Harwich-Esjberg ferry. The whole operation was personally handled by the firms' publicity managers, Norman Weymouth and Peter Crofts.

At the end of this month Abrasive Developments Ltd., the manufacturers of mould cleaning equipment, plans to take a mobile demonstration vehicle on a tour of Europe. In 12 months this van, with a staff including a company executive, will cover Germany, France, Belgium, Holland, Italy and Spain.

Both these ventures deserve — and will probably get — an upward lift to the export sales graph. To lift the country's graph out of its export doldrums, we could certainly do with more of this form of pioneer selling. (*See page* 610.)

Gilding the (Water) Lily

The practical advantage of a strong lightweight raincoat which is inexpensive and which folds conveniently into a pocket or handbag has made the general public very plastics rainwear conscious. Gone, however, are the days when a plastics raincoat was purely utilitarian — a garment fit only to be worn in a downpour when no one had eyes for what the other woman was wearing. Women have become very fashion-in-the-rain conscious and the demand for style in plastics rainwear is constantly growing.

Rubber Improvement Ltd. presented a fashion show in London last week which included 60 garments to launch a new material — Rilex — which will bring fashion into the field of plastics rainwear.

Rather heavier and more expensive than the pvc sheetings used previously, the Rilex range contains new designs and textures designed to appeal to fashion conscious women who would not have considered buying a plastics raincoat. The well-known continental designer Ingeborg Prager has interpreted in plastics the colours and textures dictated by the world's leading textile manufacturers, producing effects resembling wild silk and brocade.

Balancing the Interests

The industrialist has cause to grumble about some restrictions laid down by local councils. But, all told, councils have an unenviable job balancing the interests of one part of the community against another.

A case illustrating this is that of James Anderson and Co. (Colours) Ltd., a member of the Geigy group. This company has made an approach to Paisley Council about the embankment of a disused railway which bisects the Anderson site and impedes its long-term development. The firm has grown considerably in recent years and several projects involving extension of manufacturing and ancillary facilities are under consideration at present.

The points of view that have to be balanced are: on the one hand the Council wants to turn the embankment into a road joining a housing estate to the centre of Paisley. On the other: Anderson clearly wants long-term planning, and eventual development of the whole site might lead to an investment of £5m. and a large number of extra jobs.

Design Award

Another success has been achieved by the Paragon chemical closet, which earlier this year won a Council of Industrial Design award (*RPW* June 24, 1028). It was included in a display of the British 1961 'Designs of the Year' at the California State Fair and was awarded a gold medal.

The Paragon was designed in the Ekco design studio and is manufactured by Ekco Plastics Ltd. for Racasan Ltd. It consists of a high density polythene container fitted with a stainless steel carrying handle. The detachable seat and lid are in medium density polythene with nylon hinges and the handle has an extruded pvc grip.

Engineering with Plastics

Much interest is being shown in the conference on engineering with plastics, organized by the Plastics Institute, which will be held on October 31 and November 1. One criticism of some conferences is that not enough time is given for discussion, but this cannot be made here.

The afternoon of the second day will be an open forum. Delegates were asked to forward details of any work they wished to report. Three subjects that have arisen from this and that will be discussed are: the use of plastics grid packing in cooling towers; the development and appli-

John Lewis, chairman of Rubber Improvements Ltd., examines a raincoat made in quilted pvc sheeting. *(See: Gilding The (Water) Lily)*

cation of angled condenser bushings; and the replacement of chrome-plated zinc die-castings in components of motor cycle hardware.

The conference will be held at the Institution of Electrical Engineers, Savoy Place, London, W.C.2.

White to Move

One of the most important attributes of a set of chessmen, to my mind, is that they should be reasonably large, and heavy enough to be stable. Nothing is more frustrating

Tough, attractive and easily cleaned, these Tenite acetate chessmen are replicas of 11th-century pieces

than to plonk down one's Queen with an exultant cry of checkmate, and to find that all the other pieces have been jolted into adjacent squares.

The Florentine chessmen illustrated are made of Tenite acetate. They are pleasant to the touch, steel weighted to provide stability and balance and felt bottomed to protect table tops and chessboards. They are authentic replicas of hand-carved figurine pieces of the 11th century and simulate, with remarkable fidelity, the sculptured design and detail of the medieval craftsmanship. Although it is difficult to foresee products of our time such as these ever finding their place in museums or antique collector's cabinets, they should surely be classed as good examples of the skills of the twentieth century.

Technical Heads

As announced briefly last week, Samuel McCune III has been appointed managing director of Du Pont (UK) Ltd.

A graduate in chemical engineering of Princeton University, Mr McCune has had over 20 years' experience in elastomers research and sales work. He joined the parent company in USA in 1940 as a chemist in the company's rubber laboratory. He came to the UK company four years ago as general sales manager.

So Du Pont (UK), reflecting a general tendency, will continue to have a man with a technical background at its head. W. H. McCoy, the previous managing director, who has returned to USA on a special assignment for the parent company, joined Du Pont as a chemist on the neoprene side.

C. R. Porter

Witco Chemical Co. Ltd. has appointed C. R. Porter general manager of its Droitwich manufacturing division.

The production activities of this division embrace latex compounding for the textile and carpet industries, reclaimed rubber dispersions, starch and polymer adhesives, vinyl and acrylic copolymers, solvent adhesives, chemical dispersions and technical service laboratories devoted to research and development.

Appointments in Brief

R. C. Palmer, 32, has been appointed general manager of George E. Gray (Plastics) Ltd., of Ilford, Essex. He was formerly sales manager.

* * *

K. Dines, senior chemist in the Gillingham laboratories of Novadel Ltd., has been appointed technical sales manager, stabilizers.

Polly Ester Says...

'Foamback — gassy beer, repeat, gassy beer'

THE LEGAL ANGLE

Notice to Determine Employment

By a Barrister

NORMALLY a new employee takes on his post only after details of his employment have been agreed. And generally there is some term under which he or the company can terminate the arrangement, upon the giving of a specified period of notice. But I wonder how often there is any agreement about the date when such a period should begin?

Let us be specific. Not long ago, a company making plastics kitchenware took on a new office manager. The employment was stated to be 'subject to one month's notice on either side'.

After five weeks, the company decided that the man's methods did not suit it — he would have to go. They paid him his salary to date, and one month's pay in lieu of notice. But he claimed that as he had been taken on by the firm on the 15th of the month, he was entitled to a month's notice, terminating on the 15th of a month. In other words, he claimed an additional three weeks' pay.

When the company consulted its lawyers, they received a surprise. 'It has never been decided by any Court', they were told, 'whether or not notice terminating a contract of employment must terminate on an anniversary. So your employee may be right. . . .'

'But he may also be wrong. . . .'

'Agreed. And, indeed, he probably is. Most legal authorities take the view that a notice like this need not terminate on an anniversary — and you are almost certainly within your rights'.

The upshot? There were two. First, they paid the fellow ten days extra wages, because they did not want to become the test case on the subject. And second, they now include the following sentence in their contracts of employment: 'Your employment is subject to so many weeks' notice on either side, such notice to determine on any date, the specified period from the date when it is given'. So, in future, they have purged this doubt from their contracts.

EXPORT SURVEY

Pictures: Lep Transport Ltd.

CONTENTS

Prospects — Rubber by S. C. Covell, Director FBRAM **614**

Prospects — Plastics by H. H. Woolveridge, President BPF **614**

Rubber and Plastics in the Common Market by The Economist Intelligence Unit .. **615**

Exporting Experience—1 by D. W. Hewitt **620**

Exporting Experience—2 by C. H. Futter **621**

UK Exports of Rubber Products **622**

Export Expert by Mulroy **626**

Made in Britain **627**

Prospects — Rubber

By S. C. Covell, Director, Federation of British Rubber and Allied Manufacturers

WHEN British participation in the Common Market was first discussed some years ago, the Federation examined the probable effects on the rubber manufacturing industry, and came to the conclusion that, though a good deal of adjustment would be necessary and some hardship might well be experienced by individual firms, the industry as a whole had more to gain than to lose by the proposal.

That, I think, is still true today, and the objective analysis contributed to this issue by the Economist Intellingence Unit goes a long way to support this conclusion. In fact, if anything, the prospects for the British rubber industry within the Common Market look rather better than they did five years ago. There has been a certain amount of rationalization in the interval, and a steady — I might almost say determined — improvement in efficiency.

Even in footwear, which the Economist Unit singles out for specific mention as sensitive to European competition, we have gone a long way in the last five years towards catching up with the Continental manufacturers in design and technique; and over almost the entire range of general rubber goods, keener competition on the home market, however we may deprecate the reduction in profitability involved, has at least provided a spring-board from which our industry could take an even deeper plunge into the export market.

The Overseas Trade Committee of the Federation has been studying closely the pattern presented by our export trade with the world as a whole and the EFTA countries, as well as with the Common Market. The increase of 37% in exports of general rubber goods since the beginning of 1959 compares favourably with an average increase for the whole of British industry over the same period of 17.1%. The increase of over 50% in our exports to EFTA countries within 12 months and in direct competition with Continental Europe is even more gratifying.

Meanwhile the Federation is extremely interested in the latest Government proposals for a voluntary planning agency in this country based on the French model. The rubber industry is predominantly a service industry, and as such it cannot fail to derive considerable advantage from any democratic system which will encourage a general expansion of industry, and at the same time facilitate accurate forecasts of future expansion in its various branches. Is there any rubber manufacturer who will not admit that he would be in a better position today if he had been able to gauge the present market more accurately, two or even three years ago?

Prospects — Plastics

By H. H. Woolveridge, President, British Plastics Federation

BEFORE looking forward, let us cast a glance backwards. In the second quarter of 1961, this country's direct exports of plastics were 46,000 tons, an increase of about 10% on the corresponding period of last year. This tonnage does not include plastics articles or the substantial tonnage of plastics used as component parts in exported motor cars, etc.

So much has been written about the exciting man-made materials called plastics, so positive has been their acceptance in many directions that there is no point in extolling their virtues here.

Since they were first made commercially, plastics have shown a remarkable progress and any setbacks have been mainly due to a recession in general trading.

In the post-war years, this country's production has increased from 100,000 tons to nearly 600,000 tons. On a world-wide basis, the growth in consumption of plastics has been phenomenal. Two of the reasons for this growth are the inherent good qualities of the materials in question and the fact that they contribute to the sum of human wellbeing. It has been said — and I think rightly — that the continuation of a higher and rising standard of living is a political 'must'. Against such a background, it may be assumed that the use of plastics throughout the world will continue to increase for many years to come and therefore that the potential export market for plastics is an expanding one.

That being the case, what is the 'equipment' UK manufacturers need collectively to share in that market? Research facilities and imaginative research effort are vital if a lead is to be kept in materials, design and applications. In the highly-competitive world in which we live, production efficiencies must be second to none, not only in the various stages of plastics production, but throughout the petrochemical and chemical industries, on which the plastics industry relies for its raw materials. Adequate plant capacities to meet fluctuating demands have an importance which perhaps has not been fully recognized in the past. Above all, there must be a determination on the part of manufacturers to provide the right goods at the right price at the right time, backed by a superlative consumer technical service.

With such 'equipment' harnessed to the experience accumulated by the UK manufacturers in the production of chemicals, polymers and synthetic resins and in design and processing techniques, there should be optimism about the country's ability to increase its trade in export markets both in plastics as such and plastics as components of other goods.

Any reference to export possibilities is not complete without mention being made of the Common Market. The view is widely held that if the UK becomes a member, the overall demand for this country's goods will be stimulated. In such circumstances, additional opportunities will be available to the plastics industry to add to its already significant contribution to this country's overseas trade.

Rubber and Plastics in the Common Market

EFFECT ON THE POLYMER INDUSTRY IF UK JOINS THE SIX

THE negotiations which will follow the UK's formal application to join the Common Market are likely to be lengthy. Even if all goes well, Britain may not be a member of the Common Market before 1963.

The British public have not shown much interest in the subject. They have scarcely been encouraged to do so. British industry in general, after first being very apprehensive, swung round to being in favour of entry — or at least the large firms did. Their change of mind played an important part in persuading the Government to make the approach to the Six. The opportunities presented by the Common Market were appreciated only slowly; the undoubted difficulties received more attention. But the Common Market aims at combining the economies of member countries to form a single unit of a size comparable with the USA or the USSR. The possibilities that this offers for mass production, faster economic growth and a quicker rise in the standard of living were not to be dismissed lightly. However, if Britain joins the Common Market, it will have to dismantle all trade barriers against other member States and agree to a common external tariff which is bound to differ in many respects from Britain's present tariff structure. This country will also have to accept free movement of labour and capital between all members and in general integrate its economy with those of the Six. How will the British rubber and plastics industries fare in this process of integration?

After the USA and the USSR, Britain has the third largest rubber manufacturing industry in the world. The best measure of relative size is volume of raw rubber consumed. (Table 1.) In 1960 the UK consumed 291,000 tons of natural and

TABLE 1
RUBBER CONSUMPTION IN 1960
(000 *tons*)

USA	1,558
UK	291
West Germany	250
France	218
Italy	111
Netherlands	32
Belgium	27
Total Common Market	638
Common Market and UK	929

By the ECONOMIST INTELLIGENCE UNIT

synthetic rubber compared with 1,558,000 tons in the USA. France and West Germany used 218,000 and 250,000 tons respectively. However, the six members of the Common Market together consumed about 640,000 tons of rubber, more than twice as much as Britain.

Natural Rubber

As far as this country is concerned, enry into the Common Market should make little difference either to the availability or to the cost of our rubber. Although we will be members of a market which already uses 930,000 tons of rubber, sources of supply will hardly be affected by the Common Market. In the case of natural rubber, tariffs and quotas do not affect the pattern of imports. Natural already enters nearly every European country, including the UK, free of duty (Switzerland, the only exception, is not a member of the Common Market). There will be no external tariff at all on the import of this material and, as at present, prices will be largely determined on the open market by interplay of those

TABLE 2
UK IMPORTS OF NATURAL RUBBER BY MAIN COUNTRY OF ORIGIN, 1960
(000 *tons*)

Malaya	155*
Nigeria	22
Indonesia	8
Ceylon	8
Thailand	6
All others	13
Total	212

*Includes rubber produced in Indonesia, but shipped via Singapore.

sturdy traditional forces — supply and demand (Table 2).

Nor should Commonwealth producers of natural rubber be directly affected by our entry into the Common Market. The Commonwealth supplies about 45% of world production (Table 3). Malaya alone provides 35%. The precise share of Commonwealth rubber in European supplies of natural rubber is not known accurately, because of the large tonnages of non-Commonwealth, mainly Indonesian, rubber shipped from Singapore. However, taken together the Six are certainly the Commonwealth's most important market for natural rubber and its

TABLE 3
PRODUCTION OF NATURAL RUBBER IN THE COMMONWEALTH, 1960
(000 *tons*)

Malaya	710
Ceylon	97
Nigeria	58
India	25
British North Borneo	22
World production	1,997

access to that market will remain unrestricted, whether Britain joins or not.

The fact is that the long-term outlook for natural rubber will be determined by factors which would have developed with or without the Common Market. These are the growth of competition from synthetic rubber, particularly from the newer stereo synthetic rubbers, and the consequent need for natural rubber prices to be less volatile and more competitive in future. As long as prices remain competitive there should be little difficulty in selling all the natural rubber that is produced.

Synthetic Rubbers

At present the United Kingdom levies a general duty of 10% on all types of synthetic rubber, giving Commonwealth producers — at present only Canada — an equivalent preference. No country in the Common Market levies a tariff on any type of synthetic rubber and, as in the case of natural rubber, there is to be no common external tariff.

Synthetic rubber production on any scale has, of course, only been going on in Europe for a relatively short time. Until three years ago nearly all Europe's synthetic rubber requirements were supplied from North America. European production of all types was confined to West Germany and, to a small extent, the UK, who between them produced only 12,300 tons of synthetic rubber in 1957. Last year the UK produced over 90,000 tons compared with less than 1,000 tons in 1957, while West

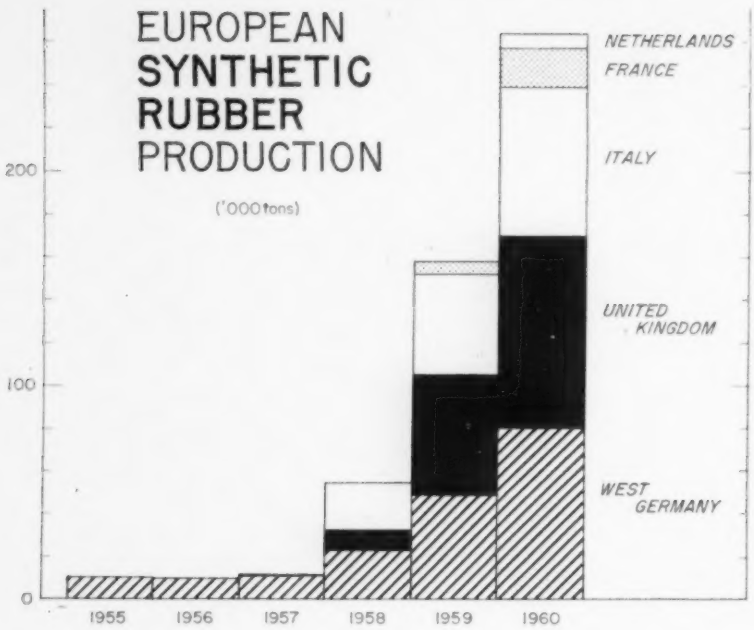


Fig. 1.

Germany turned out 80,000 tons compared with some 11,000 tons in 1951. Since 1958, moreover, France, Italy and the Netherlands have become sizeable producers. The Common Market countries produced 174,000 tons last year — 264,000 tons if the UK is added in. Of course, capacity is higher still and gaining all the time not only in the Common Market but generally throughout the world.

Consumption of synthetic rubber has similarly risen sharply; in the UK it has grown from just over 20,000 tons in 1955 to 111,000 tons last year to account for 38% of total rubber used (Table 4). As Table 5 indicates, imports have been maintained at high levels, despite the availability of ample supplies of home produced rubbers, but at the same time a promising export trade has been built up amounting to some 20,000 tons last year, most of which went outside the Six. Within the Common Market, too, consumption has also risen at fast rates and last year accounted for 41% of the total rubber used.

On the face of it Britain's entry into the Common Market should have very little effect on home producers, although it is true that the slight protection which exists against foreign producers will disappear. The increasing competition and struggle for markets arising from the start up of new productive capacity are facts which synthetic rubber producers would have had to face whether or not we join Europe. The situation facing individual synthetic rubbers (see Table 6) is briefly summarized below.

SB Rubbers

The International Synthetic Rubber Co. Ltd., the sole large-scale UK manufacturer of these general purpose rubbers, will find itself operating in a market increasingly burdened with excess capacity. While this excess capacity was located in USA, manufacturers there were willing to run their plants (largely written off) at below capacity to maintain prices. But now that producers in Italy, the Netherlands and elsewhere have put in plants with capacity far in excess of immediate and in some cases prospective home requirements, it is unlikely that prices will remain stable. On a simple comparison of cost and efficiency the UK producer should be able to withstand competition from Continental rivals who have no outstanding cost advantages. However, the profitability of its operation will certainly be lowered if price cutting spreads, and in this sense the tariff would have made it much easier to meet competition.

Butyl

UK production is not scheduled until 1963, when Esso's 30,000 ton plant at Fawley comes into operation. At present the only producer of butyl rubber in West Europe is SOCABU in France. In addition, the Polymer Corporation intend to build a butyl plant somewhere in the Common Market, but they have not yet announced definite plans. These plants, with a total capacity of between 70,000 and 80,000 tons, should easily cope with Common Market and UK needs of this rubber and competition for sales will be keen. Canadian exports to Europe will certainly suffer, although the Canadian producer will be compensated, if he sets up plant within the Common Market.

Neoprene

There are only two producers of neoprene in West Europe — Du Pont in Northern Ireland and Bayer in West Germany. Combined capacity is around 40,000 tons a year. There may well be other producers before long. Prices have remained stable for several years, but at a relatively high level and this has tended to limit the growth in consumption. There are already signs

TABLE 4
THE GROWTH IN UK CONSUMPTION OF SYNTHETIC RUBBER
(000 *tons*)

1955	1956	1957	1958	1959	1960
20.2	39.7	57.7	63.5	78.2	111.1

TABLE 5
UK TRADE IN SYNTHETIC RUBBER
(000 *tons*)

Imports					
1955	1956	1957	1958	1959	1960
25.5	43.0	57.4	56.1	38.3	57.3
Exports					
—	—	—	0.7	6.8	19.7

TABLE 6
MAJOR UK MANUFACTURERS OF SYNTHETIC RUBBER

Company	*Type of Rubber*	*Capacity*	*Comments*
International Synthetic Rubber Co.	SBR	100,000	
Du Pont	Neoprene	22,000	
Esso	Butyl	30,000	These plants are scheduled to come on stream in 1963.
Shell	Stereo Rubbers	30,000	

of a break in prices and as competition hots up, it seems likely that prices will fall further.

Nitrile

Maximum UK nitrile capacity is around 20,000 tons a year and there is a similar amount of capacity in West Germany and the Netherlands. UK producers are part of larger chemical manufacturing organizations and do not expect any difficulty in meeting Continental competition. As in the case of other synthetic rubbers, however, capacity is increasing and prices may be forced down.

Stereo Rubbers

The development of polybutadiene and polyisoprene will hardly be directly affected by the Common Market or Britain's entry. UK production of them is not expected to begin until 1963 when the Shell plant at Carrington is scheduled to come on stream. The International Synthetic Rubber Co., which is now marketing Firestone's Diene polybutadiene may also commence manufacture of the material. By 1963 plants should be operating in West Germany, France, Holland and possibly Italy. The extent to which these rubbers make inroads into markets now held by natural rubber will depend on the trend of prices, on any improvement in their technical properties — and in the overcoming of any processing difficulties. In view of the projected heavy build-up in capacity throughout West Europe, prices, which are at present somewhat higher than those of natural rubber, will have to come down, if plants are to be kept occupied.

Rubber Manufactures

The conclusion so far is that raw material costs are unlikely to change very much as a direct result of our joining the Common Market, although as a long-term trend competition between natural and synthetic rubber and between manufacturers of synthetic rubbers themselves should push the average level of rubber prices down.

Indirectly, of course, UK rubber consumption would be stimulated by our entry if it means more rapid economic expansion accompanied by a growing demand for rubber goods. A high proportion of all rubber consumed goes into the manufacture of tyres and tubes. In the UK, for example, some 54% of rubber was used for this purpose in 1960. In this sense the prospects for rubber consumption are closely tied to the outlook for motor vehicle production. Over the next ten years or so motor output in Europe is generally expected to double and as car ownership rises, so too does tyre replacement demand.

The question is how will national tyre industries benefit from these expected developments? The effects may be mitigated by the international structure of the tyre industry. All the major world tyre manufacturers have either manufacturing plants or selling companies in either the UK, the Common Market or both. Thus, for example, Dunlop have factories in West Germany and France, apart from its UK plants; Michelin factories in the UK, Belgium, France, Germany, Holland, Italy and Spain, and Pirelli in the UK, Italy and Spain. The only really large European tyre producer which has no factory in the UK is Continental which concentrates its production in West Germany. The major American tyre manufacturers — Firestone, Goodyear and US Rubber — have a large manufacturing stake in the UK and the Common Market as well.

One consequence of this international structure is that the level of intra-European trade in tyres is relatively low. It is true that throughout Europe the level of tariffs on tyres has been extremely heavy — in the UK the general tariff is 30% — but it seems unlikely that the gradual abolition of these customs barriers will radically alter the pattern of production and trade within the European tyre industry. For one thing the demand for particular sizes and types of tyre differs from country to country, because of the different makes of car, variations in road systems and surfaces, climate, topography and driving habits. These factors suggest that the policy of setting up local manufacturing plants rather than exporting to the market will persist. However, tyre manufacturers stand to gain from the general growth in car ownership anticipated during the 1960s within the Common Market. The UK tyre industry, in particular, is efficient and competitive and should certainly benefit.

Demand for the numerous other types of rubber products should also rise as a result of entry into the Common Market. There is usually a close link between demand for rubber goods other than tyres and the general growth of the economy; and to the extent that the rate of economic growth will be faster inside the Common Market than outside it, rubber goods should gain. European tariffs on these goods are on the whole high and trade between European countries has been limited. But this does not mean that when the tariffs come down trade will surge forward, although there may be some growth in imports into the UK if Britain does go into the Common Market.

In footwear, for example, UK manufacturers will have to face increasing competition from European manufacturers who appear to be more advanced in technique and design. The removal of tariffs will almost certainly stimulate Continental sales of footwear to the UK. As for other rubber goods — which cover a wide range of consumer and industrial uses — there is generally very little to choose between production costs in this country and those on the Continent. Germany is particularly competitive in hose, belting and general rubber goods, but the larger UK rubber manufacturing companies are certainly among the most efficient in Europe. Once again, all European manufacturers are likely to profit from the expected growth in demand in the next ten years. Changes in the pattern of trade will only be marginal.

Carbon Black

The present UK general tariff of 10% on carbon black is relatively low and home producers should be little affected by its disappearance. But in other respects the situation facing this material, the rubber industry's most important compounding ingredient, is changing rapidly. So far the USA has dominated world trade, but a change in the method of producing carbon black from one using natural gas to one based on oil has made it more economic in many countries to build local carbon black plants. Until quite recently the only sizeable producers of carbon black outside North America were in the UK and West Germany. Now in Europe, plants have started up in France, the Netherlands, and Italy, and total European capacity by the end of this year should be around 375,000 tons. Further projects are still in the planning stage.

However, in the UK and the Common Market, demand for carbon black should rise faster than anywhere else during the 1960s in line with the growth in rubber consumption, and existing plants in the area should be kept running at or near capacity. In any event, even if a surplus emerges in the Common Market, the international structure of the carbon black industry should, as in the case of the tyre industry, tend to reduce the competition over national boundaries. Most of the investment in Europe has been initiated by the major United States producers to offset anticipated losses in exports from their US plants. Cabot Carbon,

for instance, have or will have carbon black plants in the UK, France and Italy, Continental Carbon have interests in France, Netherlands and Italy, Columbian Carbon in the Netherlands and Italy, and Phillips in the UK, France and Italy. Several manufacturing units are joint ventures between two of these companies. For these reasons, entry into the Common Market is unlikely to affect the position of UK producers significantly.

Plastics

Plastics has been one of the major growth industries of the 1950s in West Europe. In the UK output of plastics materials has grown more than five-fold since 1949. But the rate of growth has been even faster in other European countries such as West Germany, where output totalled

TABLE 7
PLASTICS PRODUCED IN WEST EUROPE, 1960
(000 *tons*)

UK	560
West Germany	982
France	330
Italy	290
Netherlands	73
Belgium/Luxemburg	33
Total Common Market	1,708
Total Common Market + UK	2,268

982,000 tons last year compared with 560,000 tons in the UK. (Fig. 2.) Together these two countries account for about two-thirds of European production. France and Italy between them produced about 620,000 tons last year, but outside these four countries there is no sizeable plastics industry in West Europe, although the Scandinavian countries, and particularly Sweden, are large importers. Production capacity in the six Common Market countries is therefore clearly much higher than in the UK or European Free Trade Association.

The UK levies a general duty of 10% on plastics polymers which is generally lower than the prevailing duty in the three major Common Market producing countries. The Common Market's external tariff on these products is likely to be around 20% so that one consequence of Common Market membership is that UK polymer producers will receive greater protection than at present against imports from outside the Common Market, particularly from Japan and the USA. On the other hand, of course, it will have to abandon the protection it has had against Continental competitors.

TABLE 8
UK EXPORTS OF PLASTICS, 1960
(000 *tons*)

Country of Destination	
Common Market	34.3
of which	
France	8.0
Italy	7.7
West Germany	6.5
EFTA	36.0
of which	
Sweden	9.7
Denmark	7.3
Norway	4.6
Finland	4.5
Other destinations	101,700
Grand Total	172,000

The UK is a sizeable net exporter of plastics (Table 8). In 1960 172,000 tons were exported and 94,500 tons imported. Outside the Common Market the principal sources of UK imports during 1960 were the USA, Canada, whose exports receive full preferential treatment, and Japan, whose pvc was sold on this market at extremely competitive prices. Within the Common Market, West Germany was a major exporter to this country of a wide range of plastics materials, while Italy has been a growing source of polystyrene and pvc polymers. The level of imports has actually fallen during the first half of 1961, partly as a result of a drop in demand for certain consumer durables, and partly as a consequence of the downward trend in UK plastics prices, particularly in polythene and polystyrene.

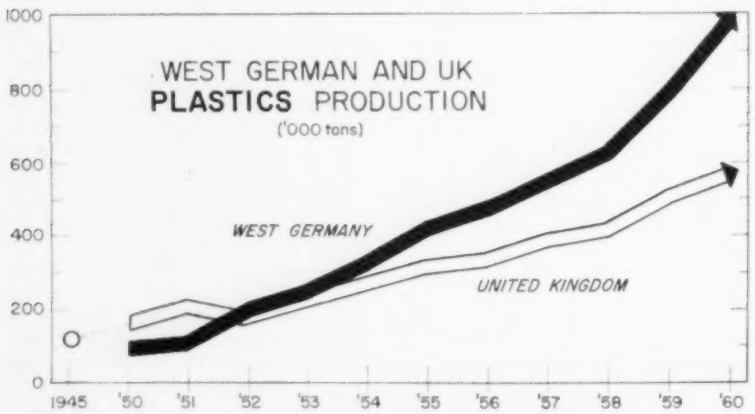


Fig. 2.

About one-third of UK plastics exports go to the Commonwealth countries. In 1960 exports to the Common Market and EFTA in each case amounted to about 20% of the total. Our sales to the Common Market have been fairly evenly spread among its members, but France and Italy have been our largest customers. In EFTA our main markets are, of course, in the Scandinavian countries. Sales to Sweden, Norway and Denmark last year were worth £5.3m. compared with total sales to EFTA countries of £8.7m. During the first half of 1961 exports to all countries have been running at an annual rate of 200,000 tons, although because of lower world prices the value of our exports is slightly less than last year.

In the case of plastics it is more than usually difficult to assess long-term prospects in more than general terms. The rate of technological progress is rapid and in the long run the success of individual companies depends on the discovery and quick exploitation of new materials. Long-term forecasts of output based on the existing structure of production are subject to such margins of error as to be almost useless. It is difficult enough to foresee the situation in five years' time, let alone in a decade. Plastics production in Europe is highly concentrated and, as far as the UK plastics industry is concerned, all that can be said is that the major manufacturers are part of large organizations, which have the resources for large-scale research and development expenditures, and that in most cases manufacturers have close links with the petrochemical industry which supplies the main raw materials for plastics production. The UK plastics industry thus seems well fitted to hold its own in the Common Market, although there may be some variation in outlook for the different materials.

The principal factor making for continued expansion of plastics production is the virtual certainty that consumption of plastics will grow sharply over the next ten years and that our membership of the Common Market will accelerate the pace of growth. Consumption per head of plastics in the UK is less than in the United States, West Germany and Sweden (Table 9). On the basis of this comparison alone there is considerable scope for raising UK usage. Furthermore, it is likely that the outlets for plastics will be ex-

tended into wider fields, such as building construction and transport, during the 1960s, and that home manufacturers will benefit from the resulting increase in requirements. However, it is by no means certain that the industry will be able to continue exporting a third of its output

TABLE 9
CONSUMPTION PER HEAD OF PLASTICS IN VARIOUS EUROPEAN COUNTRIES
(*lb.*)

West Germany ..	39.7
UK	21.0
France	16.5
Netherlands ..	15.9
Italy	11.0

or to prevent an increase in imports. This depends on the situation facing individual plastics materials.

Polyvinyl Chloride

PVC is the largest individual plastics material produced. UK output of the polymer and compound was 162,000 tons last year, but imports also touched a new peak at 35,500 tons. About 11,000 tons of pvc polymer came from the USA and Italy; West Germany and Japan between them supplied a further 10,500 tons. The high level of imports in 1960 partly reflects capacity shortages and partly the availability of cheaper polymer from Japan and Italy. Of these two, Japan, as well as the USA will face a higher tariff, if we join the Common Market, but Italy will eventually have duty free access in addition to cost advantages arising from its cheap natural gas and a high level of output.

United Kingdom polymer capacity is currently about 115,000 tons a year, and is scheduled to rise to 160,000 tons by 1963. Moreover, capacity is to be increased sharply in other countries over the next two years, which will mean that UK exports — about 16,500 tons last year — will become progressively more difficult to maintain. Home demand should continue to rise at a fast rate, particularly for pvc film, flooring and building applications, such as drain pipes, guttering and roofing. But price competition looks like being severe as new capacity starts up and in the long run UK producers may have to cede a greater share of their market to imported supplies. UK prices have fallen by about 20% over the past six years, and although there may be some margin for further reductions, it cannot be large.

Polythene

UK exports of polythene in 1960 totalled some 52,000 tons or about 50% of home production, which reached 105,000 tons. Imports were around 12,000 tons, mainly from the USA. Home consumption was thus about 65,000 tons, of which 58,000 tons is estimated to have been low density polythene. Total UK capacity for low density polythene should exceed 160,000 tons by the end of this year. Moreover, there is the parallel development of high density polythene and polypropylene capacity which is likely to total 40,000 tons by the end of 1961. UK consumption of the high density material was only 7,000 tons last year. Abroad capacity for all types is also expanding rapidly and appears in excess of current needs. In the circumstances UK exports will be lucky to maintain their 1961 levels.

On the other hand, the recent cuts in UK polythene prices should in their turn reduce imports. Polythene prices have fallen by one-third over the past two years and in the long run these reductions should help to

TABLE 10
UK PRODUCTION OF PLASTICS BY TYPE, 1960
(000 *tons*)

Thermoplastics;	
PVC (polymer and compounds) ..	162
Polythene	105
Polystyrene	40
Acrylics	20
Total (including others) ..	350
Thermosetting;	
Alkyds	50
Amino Plastics	60
Phenolics	80
Total (including others) ..	212
Grand Total	562

stimulate new outlets for polythene, particularly in fields such as packaging, which could lead to a doubling of consumption over the next five years. By and large, UK manufacturers can hold their own in competition with foreign producers, and gain from the increase in demand, but the general trend towards lower profit margins should continue.

Polystyrene

Home production was 40,000 tons in 1960. Imports and exports were more or less in balance at around 11,000 tons so that apparent usage was also some 40,000 tons. Imports rose sharply in the years up to 1960, but there has been a heavy fall this year. UK capacity for polystyrene is of the order of 60,000 tons and further increases are expected by the end of 1962. There is also considerable excess capacity in the Common Market, particularly in Italy. At the same time, consumption prospects are promising. The major outlets for polystyrene are in refrigerators, packaging, electrical, radio and television goods, housewares and toys. Demand for all these products should grow in the Common Market in line with rising personal incomes. Although polystyrene may experience competition in certain applications from alternative materials, such as pvc, overall consumption should expand steadily. However, the weight of excess capacity will almost certainly push prices down further.

Acrylics

Entry into the Common Market should not make much difference to the sources of supply to the UK home market, if only because I.C.I., the only large scale manufacturer of acrylic plastics in this country, is in such a powerful position. Output has increased steadily in recent years to around 20,000 tons, more or less the level of capacity. Looking ahead, demand for sheet material should grow steadily while consumption of moulding powders is expected to rise more substantially. Even if there is some increase in imports (4,300 tons in 1960) the home producer should gain most from the UK market.

Thermosetting Plastics

Compared with the main thermoplastic materials discussed above, production and consumption of thermosetting plastics has grown more slowly. Home output of alkyds has increased from 34,000 tons in 1954 to 50,000 tons last year, while aminos have risen from 43,000 tons to 60,000 tons. Finally, output of phenolics last year was 80,000 tons, 18,000 tons more than in 1954. In total, the share of thermosets in total UK plastics production has fallen sharply over the past six years to about 37%. This development is hardly uncommon. It has been paralleled in most of the main plastics producing countries, with the outstanding exception of West Germany, where output of both thermoplastics and thermosets has grown at about the same speed. Thermosetting moulding powders have for some years suffered from the com-

Continued on page 682

TABLE 11
THE PRESENT UK TARIFF POSITION ON RUBBER AND PLASTICS

Product	*Full*	*Rate of Duty* *Commonwealth Preference*	*EFTA*	*Proposed Common Market External Tariff*
Natural rubber	Free	Free	Free	Free
Synthetic rubber, all types	10%	Free	7%	Free
Plastic polymers, all types	10%	Free	7%	20%

EXPORTING EXPERIENCE

'In the overwhelming majority of cases, the failure of the British manufacturer to increase or even maintain his exports, or to get into the export market at all, is a function not of any external circumstances but of his general attitude towards exports. It is not that he *cannot* export but simply that he does not want to'. This was one of the conclusions of a pilot study carried out earlier this year by Marplan Ltd., for the Export Action Now Committee of the Institute of Directors. The study was made amongst small- and medium-size manufacturers. It gives plenty of evidence to show that the small manufacturer can help both himself and the national economy by exporting. The most difficult thing is to start, to break through a kind of 'export inhibition barrier'. *RPW* asked a small firm and a larger one (both in the polymer industry) to give their views on this: they are printed here. There are many small firms in the rubber and plastics industries who could sell overseas. These brief articles show that the effort needed is not enormous, and the barrier in many cases largely psychological.

The Three Doubts

By D. W. HEWITT

I THINK there are three main doubts which assail the small manufacturer when he contemplates the task of exporting.

First and foremost the vital question: how do we receive payment for the goods? We have found the production and costing easy enough. We have found out how to pack, and how to attend to the shipping details. We feel safe enough if the terms of payment are by letter of credit, but one cannot expect to do all business abroad on a letter of credit basis.

The customer is thousands of miles away, and once the goods are on the ship it is not an easy matter to get them back again without incurring more expense. How then does one make sure of payment? Say, for example, on a 30 days sight draft; the goods are already in the hands of the customer, and in that time he could easily have disposed of them, collected his money, and forgotten to pay us.

The Export and Credit Guarantee Department are an invaluable help in this direction. It means an additional insurance premium; but this is usually quite cheap and worth doing. The main trouble is that because it is an insurance, many weeks or even months may elapse before claims for non-payment are met.

Fast Return of Money

This is a problem to which the Government should give close attention if the small exporter is to be encouraged. Small manufacturers rely for their continued existence on a relatively fast return of money. If, therefore, the life blood of the country is in export, why cannot there be a guaranteed payment immediately on production of bills of lading, or at latest when the goods are landed?

Second, the formidable paper work. The first feeling is apprehension at the number of documents required. Can I spend the time away from normal production work making out six copies (at least) of certified commercial invoices; two copies of Customs invoices with innumerable questions to be answered with rigorous exactitude on the back and front; instructions to the shipping company or forwarding agent containing more or less the same information for bills of lading; then sight draft 1st and 2nd of this tenor, etc.; take all this with letter of credit to the bank; and fill out one more for good measure?

Back Room Boy

How many potential exporters are put off by this paper work? How many even of those who would be willing to take a risk on security? Surely there is a back room boy somewhere who could simplify this very arduous procedure?

Third, lack of commercial experience. It is usually the chemist/technologist type who has a go at manufacturing on his own. But how different the commercial formulae are from H_2SO_4, psi and elongation at break! As soon as he begins to inquire about bills of lading, Customs declarations, invoices, sight drafts, cif, fob, cod, insurance, there are always the knowing ones who say: Watch it! These foreigners are tricky ones to deal with. Wouldn't trust them as far as I could throw them. And so on. No wonder he decides to allow the markets abroad to go to the big boys!

This lack of commercial experience, however, is a problem which can easily be overcome by the individual once the decision to try exporting has been taken. I was amazed by the number of people who are willing to help and advise.

Mumbo-jumbo Aura

Quite by chance, our first approach was to a shipping company. Perhaps it was because we opened our first inquiries by admitting complete ignorance on procedure; but here was a mine of information freely given in non-technical language. Bills of lading, dock dues, insurances, freight charges soon lost their aura of mumbo-jumbo and became reasonably intelligible.

The bank manager can also be extremely helpful. His guiding hand through the intricacies of international financial documents is a source of confidence. He will even get a report on a prospective customer, just to make sure that he is a genuine buyer and can pay for his purchase.

An inquiry to the local Board of Trade office brought an immediate visitor to our office. No sign of officialdom here. In fact, what seemed to be a general chat about our product and our aims was really the beginning of a much more confident approach on our part to this whole export business.

At first the impression was that there were too many departments to consult. If only there were one central body to guide the beginner, to help in a practical manner with the extra costing involved in packing, dock dues, freight, insurance, and so on! Then we were introduced to such a department. Our factory is at Bradford-on-Avon, Wiltshire. We were introduced to the Rural Industries Bureau.

Here we found that we could have the services of qualified specialists,

Continued on page 627

EXPORTING EXPERIENCE — 2

No Room for Psychological Sinners

By C. H. FUTTER

IF we realize that raw material, technical knowledge and source of capital are available in all industries on more or less equal terms it should become clear that the major difference between a successful business operation and an indifferent one is — people.

One of the vital tasks in directing any business is to attract and retain personnel who will supply effective management for current operations, and from whom key executives will be drawn in the years to come. Any plans that will aid in the accomplishment of that end surely will pay for themselves many times over, both in the domestic and export field.

The critical factor to survive in exports places a heavy onus on management. If we consider the operation of management ,on the export side and compare it with domestic enterprises by and large, we will find little difference in its approach. The same problems arise such as: (1) Making operating decisions (keeping the show on the road); (2) long range planning and finding ways to measure progress towards the goal that has been established; (3) selecting, training, developing and motivating people, and especially present and future managers.

The last-named is possibly the most important. It is the basic principle without which other functions will not work. There can be little sympathy with the manager who says he has no time to train and develop his personnel. If this exercise is satisfactorily accomplished, management can find more time to think out ways and means to make more money for the company.

By experience we have found that too much concern has been placed on gadgets and techniques of personnel administration, always forgetting that these will never substitute for sound character values and high standards of personal and co-operate conduct.

The Intangibles

With these tangible aspects behind us we must be sure not to neglect the intangibles of attitudes, such as values, philosophy and spirit which support an operation. If managements have these values they will be automatically communicated to their organization and to the customer. No responsibilities can be side-stepped in the export field, and we should always be reminded that we do not fool people very long.

In the highly critical but exciting export field there is no room for the psychological sinners. For instance:

(a) The boss who fails to delegate because he does not entirely trust his subordinates.

(b) The poor team player who is concerned about how a particular move will effect his status and prerogative.

(c) The 'yes man' who will not assume responsibility for contributing his honest thinking to a problem.

(d) The would be 'big shot' who over indulges on his expense account and so on.

If we accept therefore all that has been written up to now, it will be noted that the onus is on people, and if any manufacturing unit has a staff in line with the above it remains a question for straight trading approach.

For the uninitiated who are starting from scratch, certain specific steps are essential.

(1) Good outside representation within the UK to cater for the domestic export field. A large percentage of these markets are to be found in London and should include confirming houses, export agents, international oil accounts, mining and consultants.

(2) Stocking distributors by country abroad.

(3) Representation abroad either resident or by regular visits by UK representatives. If UK representatives are used for overseas representation it is desirable that they have at least one foreign language. Preferable languages would be French and German.

(4) Literature is an important link and should be dressed up to show the basic principles and specifications of the commodities being offered rather than fancy photographs. Remember the overseas buyer is more concerned with facts and figures, preferably in the metric system, than wordy sales talk.

(5) If and when your representatives are abroad they should be briefed to call on the UK Consul or Trade Attaché, whichever is applicable. Generally these Government organizations are most helpful in suggesting business outlets and can be relied upon to arrange contacts if required.

Since the war the Englishman's stock has fallen considerably on world markets basically because of broken delivery promises, poor packaging, and delay in quoting and replying to customers' correspondence.

So we end this brief article by sounding a note of warning.

There is no point in booking business, and this is true of all countries, on the pretext of giving a delivery which the manufacturer knows he cannot keep. Eventually it breaks down your business relationship, and when the final inventory is taken of your overseas operation it will show a decline in business and a loss position.

In conclusion, many pages could be written on the question of terms of payment. If the management of your operation matches up with the earlier comments made above there should be no difficulty in this direction.

THE THREE DOUBTS

Continued from page 620

not only in exporting, but also in costing, in planning, in production control. Here is a service worthy of the name, without which we might have felt like many other small manufacturers that export was tricky, that there were too many pitfalls. But fortunately for us, assistance was there for the asking.

To sum up: we have found that personal experience is not necessary to start exporting. The first thing is to grasp the routine procedures. After that experience in more detail will come. Even yet we are far from being experts at the game; but we *are* sending our goods to various parts of the world, and so far we have not had *too* much worry.

UK Exports of Rubber Products

PROGRESS OF TRADE DURING RECENT YEARS

Statistics Specially Compiled from Official Sources by the Federation of British Rubber and Allied Manufacturers. A graph showing UK exports of general rubber products other than tyres and tubes in recent years is given on page 625.

(a) General Rubber Goods (excluding Tyres and Tubes)

Group 'A'—RUBBER MANUFACTURES —comprises sheeting, composition soling sheet, rubberized or proofed fabrics, printers' blanket, thread, hose, flooring, ebonite, other rubber-fabricated materials (including tubing), surgical products, gloves, cellular (including latex foam products), adhesives, compounds and solutions, hot water bottles, bands, erasers and various manufactures of rubber and synthetic rubber such as industrials and mechanicals.

Group 'B'—BELTING — comprises balata belting, rubber and rubber reinforced with other materials, conveyor and transmission belting, motor vehicle fan belts and pvc belting. 1959 was the first year in which figures were made available by the Board of Trade for pvc belting.

Group 'C' — FOOTWEAR — comprises industrial boots, Wellingtons, rubber bootees, overshoes and goloshes and rubber-soled canvas footwear, and soles and heels.

Group 'D' — TOYS AND BALLS — comprises golf and tennis balls, other balls for sports and games, balloons and rubber toys, and football and other bladders.

ALL COUNTRIES
(Figures in £ Sterling)

	Year 1958	Year 1959	Year 1960	First 6 mths 1961
Rubber Manufactures (Group 'A')				
Sheets and sheeting	566,401	556,715	622,050	354,467
Rubberized or proofed fabrics	1,587,260	1,625,359	3,185,051	1,676,154
Thread	496,788	491,691	669,451	312,328
Hose	2,442,039	2,421,359	2,828,971	1,661,426
Flooring	351,482	386,499	464,673	237,308
Ebonite, etc.	298,976	176,288	198,688	124,683
Other rubber fabricated materials	155,451	281,974	300,469	208,590
Surgical products	667,427	727,570	771,916	542,884
Hot-water bottles	213,219	240,098	276,839	104,164
Cellular rubber	800,634	729,026	744,033	334,505
Other products	3,764,519	4,047,708	4,876,246	2,913,804
Total	11,344,196	11,684,287	14,938,387	8,470,313
Belting (Group 'B')				
Balata	147,454	167,533	178,587	92,069
Rubber, and reinforced rubber conveyor and transmission	2,658,037	2,798,196	2,992,885	1,701,631
Motor vehicle fan belts	221,965	186,171	183,234	121,168
PVC belting	—	362,125	386,954	112,538
Total	3,027,456	3,514,025	3,741,660	2,027,406
Footwear (Group 'C')				
Boots and shoes	1,646,483	1,522,775	1,495,061	654,664
Soles and heels	274,783	246,028	655,983	352,111
Total	1,921,266	1,768,803	2,151,044	1,006,775
Toys, Balls, etc. (Group 'D')				
Golf and tennis balls	1,320,282	1,524,744	1,617,629	1,014,421
Other toys, balls and bladders	213,005	214,831	260,478	156,037
Total	1,533,287	1,739,575	1,878,107	1,170,458

(Figures in £1,000 Sterling)

Group	Year 1958	Year 1959	Year 1960	First 6 mths 1961
AUSTRALIA				
'A'	763.2	684.7	978.7	532.3
'B'	85.8	86.9	242.2	213.9
'C'	23.9	12.7	35.0	12.5
'D'	41.1	44.4	82.1	51.6
AUSTRIA				
'A'	53.8	54.8	49.9	30.3
'B'	6.4	4.5	6.8	3.6
'C'	117*	78*	556*	147*
'D'	13.8	18.2	18.5	25.0
BELGIUM				
'A'	319.4	309.1	492.1	221.8
'B'	92.8	135.7	144.3	95.4
'C'	36.3	40.0	30.6	13.8
'D'	28.5	42.2	49.2	28.8
CONGO REPUBLIC				
'A'	11.4	13.1	9.6	1.6
'B'	65.6	36.6	24.9	38.7
'C'	289*	650*	195*	—
'D'	6.8	4.7	2.6	971*
BURMA				
'A'	59.5	76.0	61.4	27.1
'B'	24.1	89.3	71.7	11.8
'C'	8.8	13.7	15.4	6.5
'D'	16.7	20.6	17.6	8.5

Group	Year 1958	Year 1959	Year 1960	First 6 mths 1961
CANADA				
'A'	474.8	515.2	648.2	374.5
'B'	237.3	230.1	282.9	115.9
'C'	261.2	324.2	353.2	125.1
'D'	135.0	134.1	134.5	111.8
CEYLON				
'A'	72.9	71.3	125.5	58.2
'B'	19.8	25.5	32.0	16.6
'C'	3.0	4.0	3.3	1.9
'D'	5.9	3.6	3.9	1.6
CHILE				
'A'	36.5	41.5	58.6	36.4
'B'	127.8	113.2	132.2	54.1
'C'	4.3	4.7	4.0	1.2
'D'	4.7	3.1	11.5	3.4
CUBA				
'A'	36.5	18.4	20.2	6.3
'B'	10.1	3.8	2.1	7.8
'C'	13.8	10.7	1.3	—
'D'	12.3	8.6	7.7	885*

**Actual figures not £1,000*

UK Exports of Rubber Products

(Figures in £1,000 Sterling)

Group	Year 1958	Year 1959	Year 1960	First 6 mths 1961
CYPRUS				
'A'	40.2	47.5	41.6	21.5
'B'	12.4	9.4	13.8	16.5
'C'	21.2	38.8	29.4	10.3
'D'	4.6	3.3	3.2	1.2
DENMARK				
'A'	274.9	319.8	455.7	262.8
'B'	21.1	21.3	21.7	9.7
'C'	9.2	12.3	12.9	8.1
'D'	10.5	12.6	12.1	8.4
UNITED ARAB REPUBLIC (EGYPT AND SYRIA)				
'A'	37.1	63.4	87.4	29.3
'B'	14.6	8.3	29.3	2.3
'C'	1.8	1.9	853*	35*
'D'	5.4	5.9	1.2	1.4
FINLAND				
'A'	231.3	247.6	273.3	193.1
'B'	30.6	18.6	29.1	32.9
'C'	1.3	609*	1.4	435*
'D'	788*	2.1	4.9	3.2
FRANCE				
'A'	225.2	209.8	405.8	277.9
'B'	33.0	37.1	52.2	18.6
'C'	6.5	4.5	7.4	8.1
'D'	40.8	40.0	47.3	35.0
GERMANY (WESTERN)				
'A'	417.7	538.1	635.0	273.4
'B'	10.0	5.0	14.7	17.9
'C'	19.8	31.4	41.6	28.2
'D'	58.8	70.5	91.8	61.8
GHANA				
'A'	214.6	197.6	239.5	102.3
'B'	52.4	49.8	64.4	19.1
'C'	25.9	21.3	47.6	13.3
'D'	4.4	6.2	5.5	1.9
GREECE				
'A'	39.6	60.8	58.2	45.7
'B'	13.4	13.8	8.0	4.6
'C'	477*	582*	1.1	426*
'D'	2.1	1.7	2.0	3.1
HONG KONG				
'A'	152.8	114.2	166.8	95.1
'B'	14.5	14.6	18.7	11.4
'C'	9.8	14.0	18.0	12.0
'D'	59.4	60.7	97.2	41.3
ICELAND				
'A	40.3	34.8	32.7	12.1
'B'	8.5	8.2	6.6	2.5
'C'	2.7	1.9	6.8	1.6
'D'	240*	107*	43*	—
INDIA				
'A'	155.6	160.1	264.9	161.3
'B'	124.8	151.1	424.4	63.2
'C'	703*	3.8	8.2	8.3
'D'	15.0	7.3	8.6	4.5
INDONESIA				
'A'	50.7	42.8	43.0	19.5
'B'	15.5	44.1	11.1	27.7
'C'	886*	1.3	692*	481*
'D'	15.3	64.8	29.3	754*
IRAN				
'A'	147.7	439.7	173.4	89.4
'B'	17.1	22.3	26.4	12.9
'C'	46.7	10.3	11.1	2.0
'D'	3.4	5.7	7.2	1.2

Group	Year 1958	Year 1959	Year 1960	First 6 mths 1961
IRAQ				
'A'	84.4	79.2	111.7	33.6
'B'	21.8	22.0	18.8	22.2
'C'	8.8	10.6	9.3	3.1
'D'	4.4	1.4	4.7	1.4
IRISH REPUBLIC				
'A'	732.5	771.8	947.7	547.3
'B'	87.2	89.4	90.6	45.8
'C'	79.4	67.7	250.9	141.9
'D'	18.5	19.1	19.3	12.6
ITALY				
'A'	498.4	520.4	877.3	559.3
'B'	59.0	36.4	44.3	63.5
'C'	3.9	3.7	5.4	6.3
'D'	26.0	29.9	35.8	25.2
JAMAICA				
'A'	118.7	90.2	114.1	64.1
'B'	38.5	36.6	43.2	15.4
'C'	135.6	132.6	108.4	41.0
'D'	9.4	14.9	21.9	11.5
KENYA, TANGANYIKA-UGANDA				
'A'	144.0	131.1	148.0	82.5
'B'	57.9	77.9	85.9	51.2
'C'	70.7	76.2	71.8	46.2
'D'	7.2	7.4	7.3	4.9
KUWAIT				
'A'	179.3	75.7	71.3	32.7
'B'	8.8	6.1	2.7	4.6
'C'	2.4	14.0	5.3	627*
'D'	1.8	870*	1.5	787*
LEBANON				
'A'	39.1	90.2	97.7	68.9
'B'	4.2	4.5	4.1	3.5
'C'	7.2	8.6	9.6	2.5
'D'	5.2	2.9	4.3	2.1
MALAYA AND SINGAPORE				
'A'	228.6	219.6	268.7	180.7
'B'	61.0	62.2	105.8	57.9
'C'	65.5	27.0	22.2	10.4
'D'	53.2	28.8	37.1	22.5
MALTA AND GOZO				
'A'	47.4	49.0	81.2	44.3
'B'	20.6	3.7	2.5	1.4
'C'	8.0	7.7	8.9	3.0
'D'	2.2	2.7	2.0	2.1
NETHERLANDS				
'A'	556.9	552.8	855.6	472.1
'B'	90.0	119.2	131.9	89.6
'C'	5.6	5.8	8.0	4.5
'D'	41.5	47.0	52.4	34.3
NETHERLANDS ANTILLES				
'A'	35.3	34.5	31.2	6.6
'B'	2.7	279*	1.0	36*
'C'	3.8	6.1	3.0	978*
'D'	3.2	2.4	2.2	1.7
NEW ZEALAND				
'A'	638.9	468.9	925.7	512.9
'B'	239.7	198.5	204.6	114.9
'C'	53.5	21.4	76.8	35.5
'D'	96.6	85.1	116.2	73.8
NIGERIA				
'A'	221.0	214.5	251.8	134.1
'B'	27.1	20.7	36.2	20.9
'C'	214.9	130.2	161.1	54.0
'D'	8.9	24.2	18.3	9.4

Actual figures not £1,000

UK Exports of Rubber Products

(Figures in £1,000 Sterling)

Group	Year 1958	Year 1959	Year 1960	First 6 mths 1961
NORWAY				
'A'	314.7	317.1	419.6	238.4
'B'	10.1	23.9	21.5	13.5
'C'	10.1	4.5	20.3	8.6
'D'	3.2	4.9	4.7	12.1
PAKISTAN				
'A'	78.0	85.0	184.2	60.5
'B'	56.8	42.4	46.8	33.7
'C'	—	1.1	6.8	1.2
'D'	9.3	12.0	7.9	4.2
PERU				
'A'	61.0	43.1	80.1	80.5
'B'	28.4	61.6	53.3	18.7
'C'	1.6	1.9	5.3	1.6
'D'	5.0	5.8	4.2	2.8
PORTUGAL				
'A'	73.3	71.0	83.5	70.5
'B'	30.0	37.1	33.0	27.4
'C'	29.1	21.6	20.3	25.6
'D'	3.5	2.7	5.1	3.1
FEDERATION OF RHODESIA AND NYASALAND				
'A'	100.8	102.4	129.1	98.5
'B'	194.4	98.5	91.1	63.0
'C'	66.4	70.4	80.5	43.5
'D'	22.4	27.7	22.8	17.1
SAUDI ARABIA AND JORDAN				
'A'	68.5	54.4	56.6	20.4
'B'	7.1	5.1	8.3	2.1
'C'	16.8	5.0	4.8	1.3
'D'	3.2	4.2	5.0	1.7
SIERRA LEONE				
'A'	25.8	19.8	35.9	15.7
'B'	35.1	30.4	12.6	5.3
'C'	20.2	11.8	13.3	7.9
'D'	1.8	1.0	1.1	885*
SWEDEN				
'A'	672.5	611.9	824.7	466.7
'B'	55.2	36.9	43.9	15.5
'C'	12.6	7.8	24.5	20.8
'D'	44.1	34.5	50.9	32.4
SWITZERLAND				
'A'	220.4	280.6	233.9	142.1
'B'	56.0	47.4	45.6	36.2
'C'	5.8	6.0	8.8	5.9
'D'	31.5	38.1	34.6	29.2
THAILAND				
'A'	59.4	68.7	61.2	31.1
'B'	25.3	20.1	29.4	14.8
'C'	664*	1.0	699*	393*
'D'	11.3	13.7	12.2	4.4
TRINIDAD AND TOBAGO				
'A'	113.3	134.4	154.7	71.5
'B'	11.9	14.8	11.1	5.5
'C'	123.2	105.9	115.2	51.3
'D'	9.2	9.9	13.9	4.3
TURKEY				
'A'	18.6	31.3	42.0	34.9
'B'	36.3	37.2	135.7	9.2
'C'	135*	482*	114*	1.3
'D'	1.8	2.6	2.2	3.9
UNION OF SOUTH AFRICA				
'A'	656.0	501.9	588.1	462.1
'B'	348.6	271.2	271.2	161.4
'C'	11.6	15.8	57.3	35.4
'D'	100.3	112.5	110.1	63.7
USA				
'A'	391.2	702.9	731.9	457.2
'B'	25.7	68.7	104.9	12.4
'C'	183.1	216.3	161.3	76.7
'D'	224.9	323.2	313.6	215.5
VENEZUELA				
'A'	174.9	178.9	127.1	42.3
'B'	31.1	41.6	37.3	23.8
'C'	19.6	16.6	11.9	848*
'D'	33.8	43.1	31.0	21.8

Actual figures not £1,000

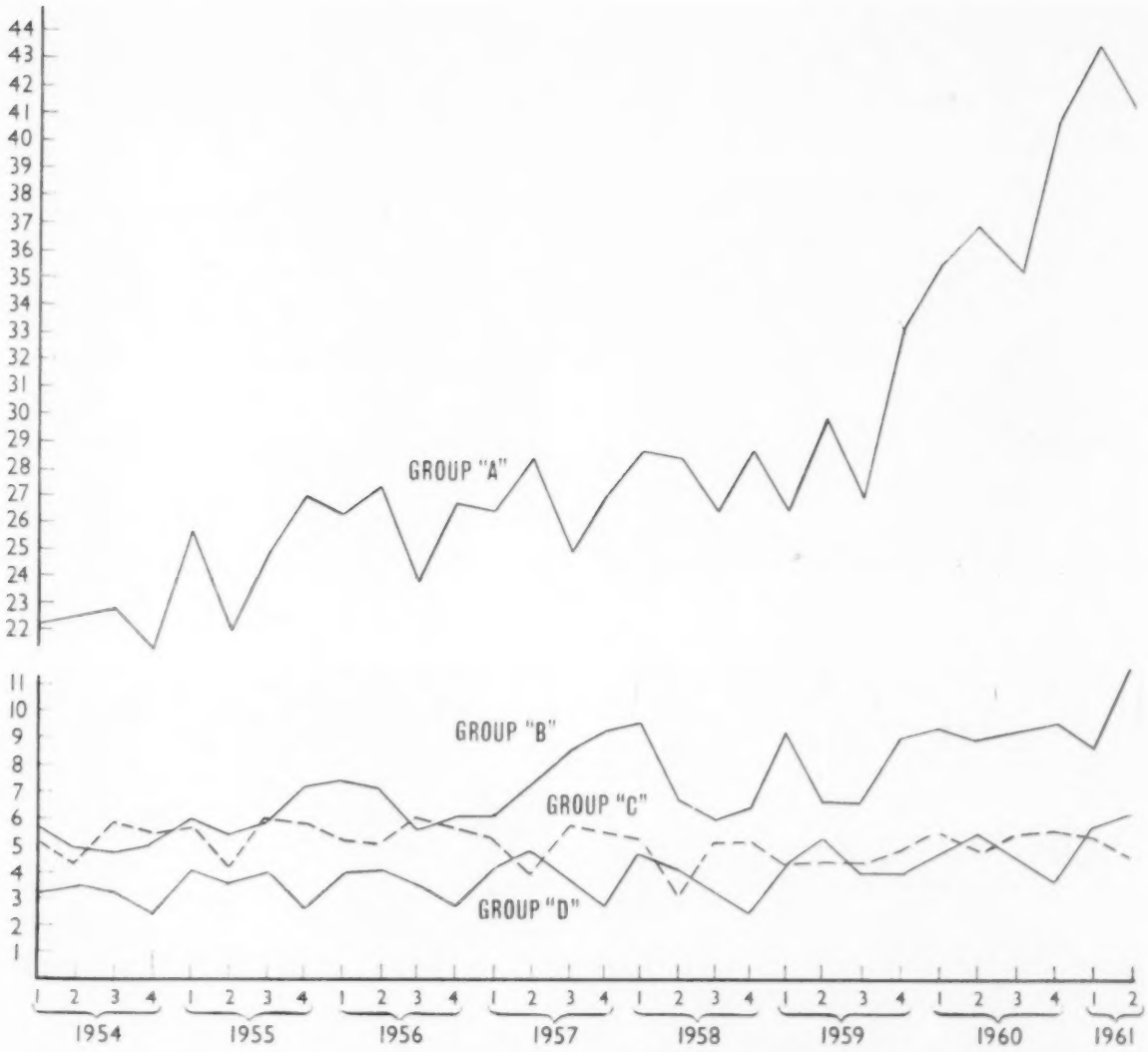
(b) Tyres and Tubes

ALL COUNTRIES

(Figures in £1,000 Sterling)

	Year 1958	Year 1959	Year 1960	First 6 mths 1961
Outer Covers				
For aircraft	624.6	806.1	915.1	500.8
For motor-cycles and tricycles	434.3	498.6	493.1	237.3
For other motor vehicles:				
New giant	10,501.7	11,088.4	11,967.1	6,871.3
New tractor and dumper and earth mover	2,205.7	2,561.6	2,882.3	1,938.2
New other sorts	5,293.1	6,511.4	7,078.3	3,546.5
Reconditioned or used giant	91.8	70.7	66.6	17.5
Reconditioned or used other sorts	418.3	487.9	429.7	171.3
For cycles	1,700.0	1,436.8	1,529.9	1,005.7
Other sorts	170.0	168.6	189.1	108.7
Total	21,439.8	23,630.5	25,551.2	14,397.4

	Year 1958	Year 1959	Year 1960	First 6 mths 1961
Inner Tubes				
For aircraft	48.8	41.9	45.4	16.9
For motor-cycles and tricycles	80.0	94.8	95.6	48.5
For other motor vehicles:				
Giant	626.5	622.1	689.1	374.1
Tractor and dumper and earth mover vehicle	124.3	163.2	196.0	141.8
Other sorts	528.9	516.9	615.6	343.0
For cycles	557.8	433.7	483.2	264.8
Other sorts	19.0	32.3	28.6	20.2
Total	1,985.6	1,905.3	2,153.5	1,209.2
Cushion and solid tyres	61.3	62.2	85.9	63.4
Camelback and other tyre repair materials	719.6	784.4	778.0	337.0
Grand Total	24,206.4	26,382.6	28,568.7	16,007.0



Graph showing UK exports (by value) of rubber products other than tyres and tubes, by quarters 1954, 1955, 1956, 1957, 1958, 1959, 1960 and January to June 1961

Contents of Groups 'A' (Rubber Manufactures), 'B' (Belting), 'C' (Footwear) and 'D' (Toys and Balls) are given in detail on page 622. Figures on the vertical scale represent £100,000.

COMMENTS ON THE EXPORT GRAPH

Total exports of general rubber goods (excluding tyres and tubes) continue to show an increase on previous years. The total figures at the end of the year showed an increase of over four million pounds, a remarkable achievement in relation to previous years. The figures for the first half of 1961 are well over a million pounds higher than the corresponding period in 1960.

Group 'A'—Rubber Manufactures

Exports in Group 'A', during the third quarter of 1960, lagged behind the second quarter but picked up to reach a record height in the fourth quarter. This record was itself broken by the figures for each of the first two quarters of 1961.

Group 'B' — Belting

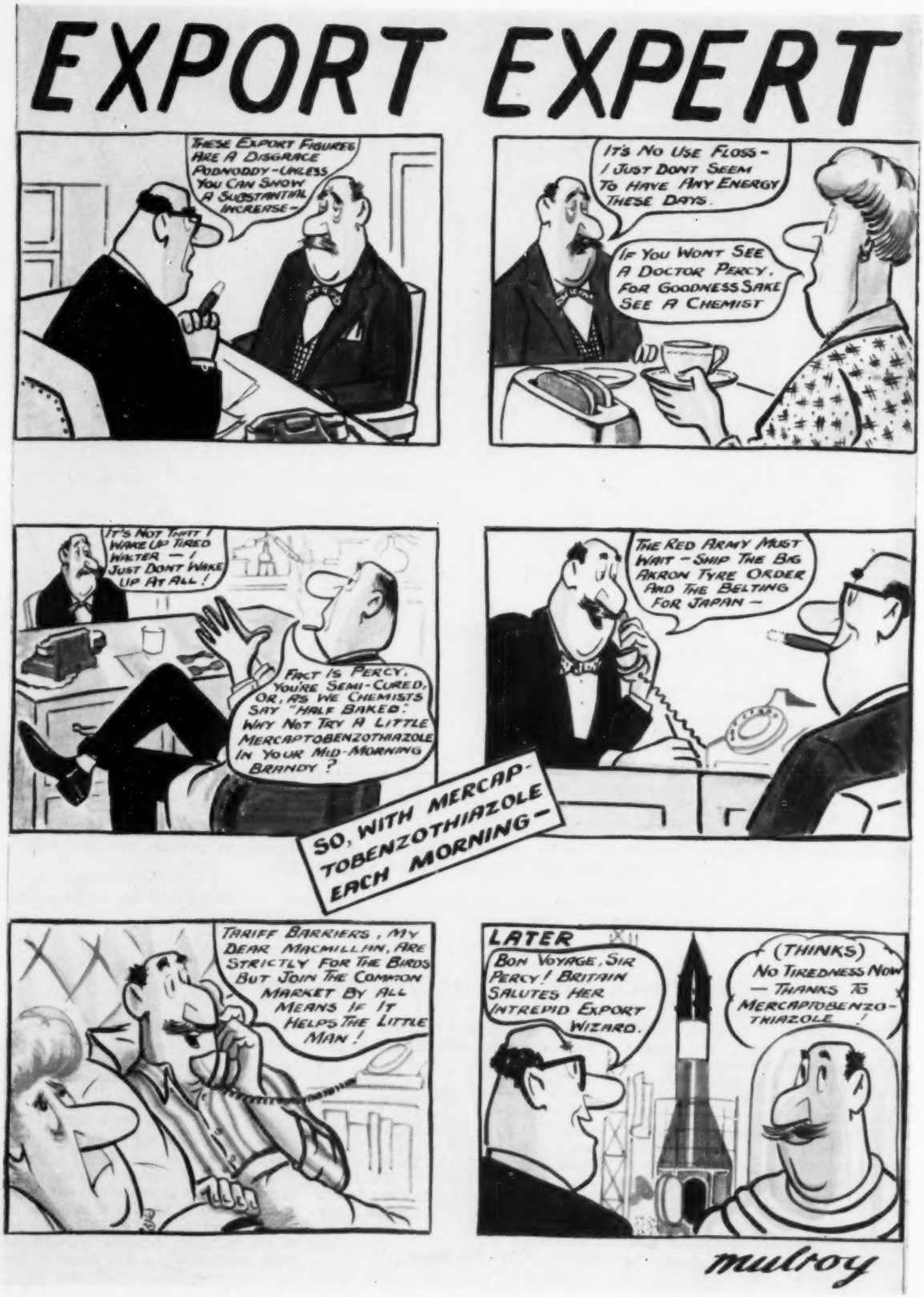
Export sales of belting in the third quarter of last year were slightly above those in the second quarter; in the fourth quarter they rose more sharply. Whereas in the first quarter of this year they fell below the seasonal average, in the second quarter they reached a new peak.

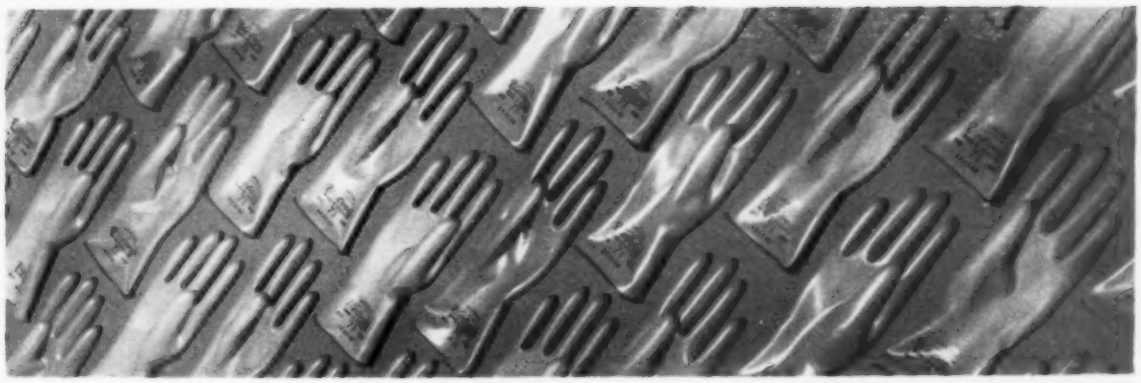
Group 'C' — Footwear

Exports of footwear in the third quarter of 1960 were higher than in the previous quarter. The steady gain of the fourth quarter of 1960 was to some extent maintained in the first quarter of 1961, but in the second quarter a substantial fall in sales occurred.

Group 'D' — Toys and Balls

The seasonal fall in Group 'D' exports which occurred in the last two quarters of 1959 repeated itself during the corresponding period of 1960. The usual seasonal rise also took place in the first two quarters of 1961. For all of the past four quarters figures have been substantially above those of the previous four, with a new peak being reached in the second quarter of this year.


EXPORT EXPERT
THESE EXPORT FIGURES ARE A DISGRACE PODNODDY - UNLESS YOU CAN SHOW A SUBSTANTIAL INCREASE -
IT'S NO USE FLOSS - I JUST DONT SEEM TO HAVE ANY ENERGY THESE DAYS.
IF YOU WONT SEE A DOCTOR PERCY, FOR GOODNESS SAKE SEE A CHEMIST
IT'S NOT THAT! I WAKE UP TIRED WALTER — I JUST DONT WAKE UP AT ALL!
FACT IS PERCY, YOU'RE SEMI-CURED, OR, AS WE CHEMISTS SAY "HALF BAKED": WHY NOT TRY A LITTLE MERCAPTOBENZOTHIAZOLE IN YOUR MID-MORNING BRANDY?
THE RED ARMY MUST WAIT - SHIP THE BIG AKRON TYRE ORDER AND THE BELTING FOR JAPAN -
SO, WITH MERCAP-TOBENZOTHIAZOLE EACH MORNING -
TARIFF BARRIERS, MY DEAR MACMILLAN, ARE STRICTLY FOR THE BIRDS BUT JOIN THE COMMON MARKET BY ALL MEANS IF IT HELPS THE LITTLE MAN!
LATER
BON VOYAGE, SIR PERCY! BRITAIN SALUTES HER INTREPID EXPORT WIZARD.
(THINKS) NO TIREDNESS NOW — THANKS TO MERCAPTOBENZO-THIAZOLE!
mulroy



Latex and solution-type gloves and gauntlets and those produced from neoprene, butyl and pvc constitute the traditional product range in which Veedip Ltd. has specialized for many years. The illustration shows the Velvex solution-type surgeon's glove, supplied to hospitals in the United Kingdom and in many overseas countries. The company and its associated company, Lewis Gilder and Co. Ltd., produce gloves and gauntlets in a wide and varied range for use throughout industry. Gloves and gauntlets are also manufactured to the difficult and specialised requirement of the Atomic Energy Research Establishments of this and many overseas countries. The subsequent application of these gloves is both varied and exacting, demanding a high and consistent quality. **Veedip Ltd., Slough, Bucks.**

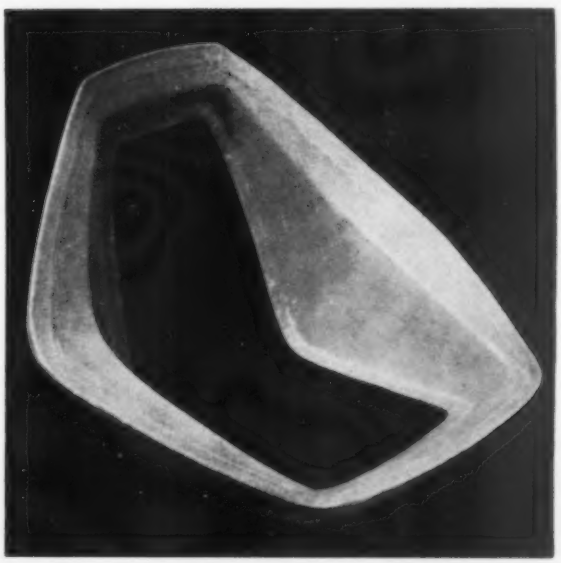
Rubber and Plastics Products— Made in Britain

PICTURED on this and the following pages is a representative cross-section of rubber and plastics goods from British manufacturers. The range is comprehensive within the limits of space, but it is, of course, impossible to illustrate more than a fraction of the tremendous variety of products marketed by the British rubber and plastics industries.

ON verra illustrée sur cette page et les suivantes une tranche représentative des articles en caoutchouc et en matières plastiques de chez les fabricants anglais. La gamme est complète dans les limites de la place disponible, mais il est naturellement impossible d'illustrer plus qu'une fraction de l'énorme diversité des fabrications mises en vente par les industries anglaises du caoutchouc et des plastiques.

DIE Abbildungen auf dieser und den folgenden Seiten geben einen Uberblick über die Erzeugnisse der britischen Kautschuk- und Kunststoffindustrien. Obwohl die Auswahl so reichhaltig getroffen wurde, wie es der verfügbare Raum gestattet, ist es natürlich unmöglich, mehr als einen Bruchteil der ungeheuren Vielfalt von Produkten abzubilden, die von den britischen Kautschuk- und Kunststoffabriken auf den Markt gebracht werden.

IN questa pagina e nelle seguenti si illustra un assortimento svariato medio degli articoli di gomma e di plastica prodotti dai fabbricanti britannici. La gomma è vasta tenendo in conto le limitazioni di spazio disponibile, ma naturalmente è impossibile illustrare più di una piccola parte della enorme varietà di prodotti lanciati sul mercato dalle industrie britanniche della gomma e della plastica.



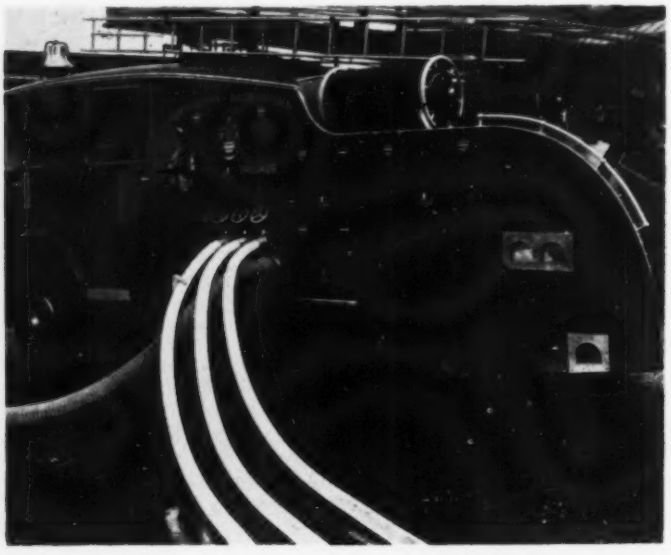
Reinforced glass-fibre mouldings for the furniture industry are a new export from Vitafoam Ltd., who recently formed a subsidiary company, Vitesta Ltd., to specialize in this field. Aidron Duckworth, one of Britain's leading designers of glass-fibre mouldings — and a director of Vitesta — designed this chair shell. An exhibition arranged jointly by Vitafoam and the International Synthetic Rubber Co. has recently been touring on the Continent to stimulate interest in both companies' products, particularly in Denmark (see page 610). Vitafoam already has subsidiaries or agents in several European countries and is in a strong position to sell to the Common Market and to EFTA. **Vitafoam Ltd., Don Mill, Middleton, Manchester.**

Pictured are specimens of moulded unit soles produced for the footwear industry. At present the company is mainly featuring the translucent or gristle type of compound, finding that there is a steady trend in this direction. At the same time, it says, the more orthodox resin rubber solings continue to step out sales. **Boro Rubber Co. (1912) Ltd., Para Rubber Works, Smithy Bridge, Littleborough, Lancs.**

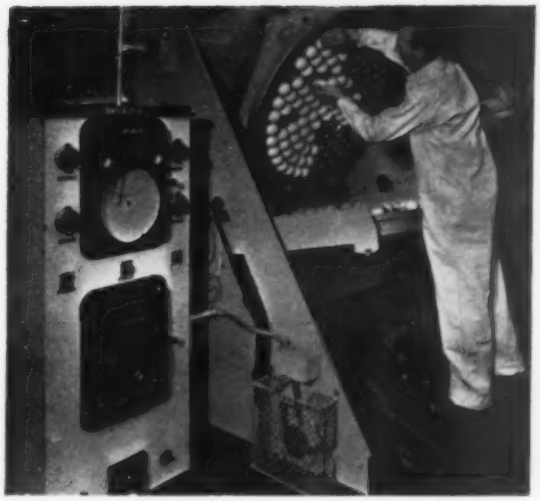
A member of the giant Smiths group of companies, Portland Plastics produces a wide range of tubing for specialized and generalized applications. The company claims to be the only one in the UK producing marnyl nylon tubing in the fine bore sizes required for gas chromatography (0.010 — 0.040in.). Illustrated is pvc laboratory tubing (bore diameter 0.62in. — 0.375in.) which is made in five opaque colours. **Portland Plastics Ltd., 197 Knightsbridge, London, S.W.7.**

The company is one of the foremost moulders in the UK, producing many components for the refrigeration, electrical and allied industries. It also moulds consumer goods such as this Supersink. Made in polypropylene it will withstand temperatures in excess of boiling water and is very rigid at room temperature. The draining board incorporated in the unit is made firm by concealed stiffening ribs. It is designed to fit on a cabinet with overall dimensions of 42in. x 18in. and having a supporting framework up to 1in. thick. **Ekco Plastics Ltd., Southend-on-Sea, Essex.**

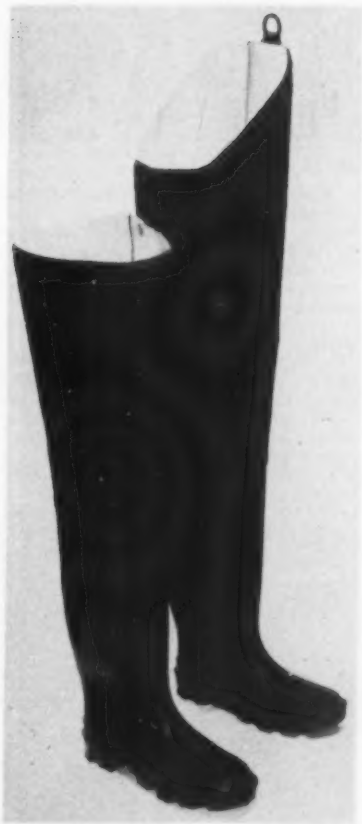
The company's Hose, Linings and Coverings Division has built up a high reputation for its products — illustrated is one of the latest, Plastidry pvc/nylon hose. This can be safely exposed to steam, chemically-polluted air and strong sunlight for long periods. BTR recently received a £300,000 contract to supply the Home Office with more than 65 miles of this Plastidry hose. It will be used for emergency fire-fighting purposes. **BTR Industries Ltd., Hose, Linings and Coverings Division, Herga House, Vincent Square, London, S.W.1.**



One of the fastest growing sectors of Dunlop's many interests is sports goods. The business has developed from the manufacture of golf balls and tennis racquets until it now touches nearly every ball game in existence. Under-water swimming suits, fins, masks and snorkels are also produced, and the latest addition is fishing tackle. With shorter working weeks meaning more leisure there will obviously be plenty of expansion to come. The picture shows the final moulding of completely covered tennis balls. **Dunlop Sports Co. Ltd., 136-142 Victoria Street, London, S.W.1.**

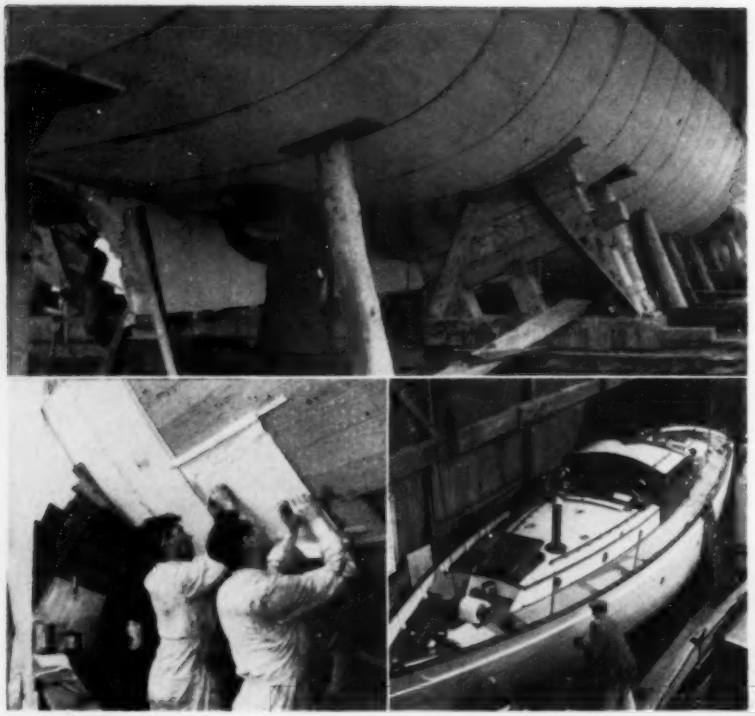


Pictured is the new CFL 21 electric shaver manufactured for the export market by Ronson Products Ltd. The plastic components which form the outer casing are moulded by the plastics division of UMP at its Southport factory. The foil frame in white, shown centre front, is made from Du Pont's Delrin acetal resin, the housing and cover being in blue acrylonitrile styrene. The lettering on the cover is hot-stamped. **Plastics Division, Universal Metal Products Ltd., Salford, Lancs.**



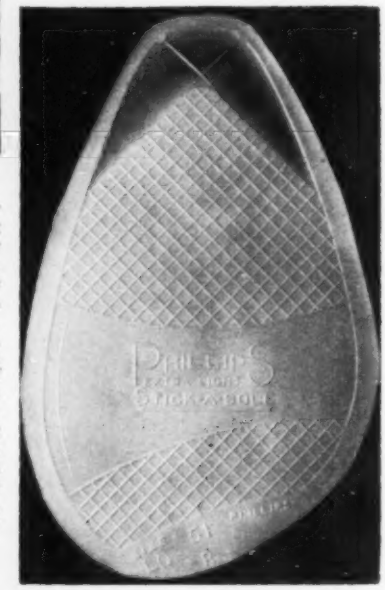
Avon Stonehenge seamless moulded and lined rubber boots, with the integrally moulded tractor-tread sole are now produced in four types: short, knee, three-quarter thigh, and full thigh lengths. Men's single size 6-11. In the company's range of man-made soling materials are: Nuberlite and Royal Nuberlite resin solings; Nubersole and Novalite microcellular solings and Mannide sandal units. Avon also specialize as independent suppliers of compounds, adhesives and technical service for all types of moulded footwear, and moulding machinery in the direct vulcanization process. **Avon Footwear Sales Ltd., Bridgend, Glamorgan.**

The recent trend of V-belt drives has been in the direction of narrower or smaller endless belts, capable of transmitting higher horse power. The company has done much work in this direction, and has now developed this 'Brammer Plus' link belt. The rubber sheeting used is made from a complicated blend of cotton and man-made fibres, vulcanized with special synthetic rubber. It is claimed that this combination makes a belt which is considerably stronger in every way, will transmit greater horse power, give a longer life, and in addition is heat and oil resisting. In addition to the UK factory, from which exports go to over 70 countries in the world, Brammer V-link belting is also manufactured in its factories in the USA and India. **H. Brammer and Co. Ltd., Hudson Road, Leeds 9, Yorkshire.**



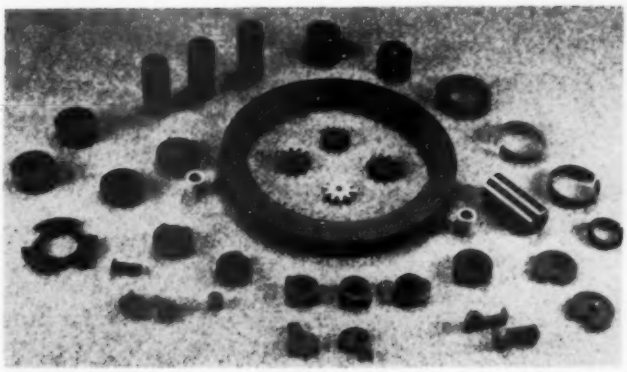
A wooden craft with a plastic sheathed hull, coach roof and deck goes a long way towards achieving the best of both worlds in boat building since it enables the boat builder to combine some of the advantages of both timber and plastics. The Cascover nylon sheathing process developed by the company utilizes three well-tried materials. The sheathing itself is a specially treated and woven nylon cloth. This is glued to the timber with a fully weatherproof resorcinol resin glue similar to the grades of Cascophen resorcinol glue approved by the Admiralty and Surveyors of Lloyds Register of Shipping. A vinyl resin finish is applied to thoroughly impregnate the nylon cloth after it has been glued to the timber. The Tropical Testing Department of the Ministry of Supply has carried out tests on sheathed material, reporting: 'Sheathing with either of two weights of nylon fabric, with or without vinyl resin finish, has protected African mahogany panels against shipworm (Teredo) attack for 49 weeks in raft trials at Port Harcourt, Nigeria. Unprotected panels were completely destroyed in this time'. (*Top*) Cascover sheathing being applied to the hull of HMS *Everingham*, an inshore minesweeper. Work was carried out by James Taylor (Shipbuilders) Ltd., of Shoreham. (*Bottom left*) A completed area of the hull of HMS *Everingham* after sheathing but before the application of the vinyl resin finish. (*Bottom right*) Cascover nylon sheathing protects the cabin tops of *Mia*, a 43-ft. motor sailer, built by A. H. Moody and Son Ltd., of Southampton. **Leicester Lovell and Co. Ltd., North Baddesley, Southampton.**

This extra light rubber Stick-a-Sole is walked on all over the world. Wafer-thin, it is made in a very wide range of sizes. Phillips also exports rubber long soles, heels, sheeting, heelgrips and arch supports, Beritex meteorological balloons and Beritex football bladders, to every corner of the world. **Phillips Patents Ltd., Western Avenue, Acton, London, W.3.**



One of the foremost rubber glove manufacturers, the company produces a wide selection in a variety of weights. It has an excellent export record—more than 50% of its output going overseas. Being worn in the picture are Marigold New Style gloves, one of the company's best selling lines. Suedette lined, they are also fluted so that they do not drop back on to the wrist. Another outstanding success is the Marigold Featherweight, designed for delicate work. **J. Allen Rubber Co. Ltd., Whitecroft, Lydney, Gloucestershire.**

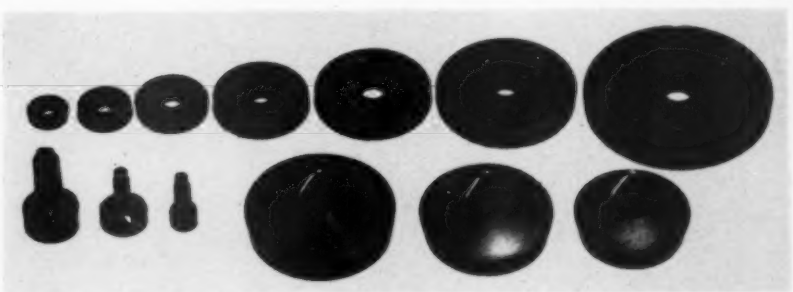
The company fabricates pipes like these and ductings in glass reinforced polyester. Pipes are produced with bore dimensions from 1½in. to 20in., in lengths up to 40ft. without joints. The wall thickness of the material can be varied between $\frac{1}{4}$in. and $\frac{3}{16}$in. By variation of weaves of glass fabric, *i.e.* square weave, satin weave, unilateral weave, pipes can be designed to give major strength characteristics to suit specific applications. In addition, by incorporating synthetic fabrics of the Terylene type, chemical and abrasion resistance can be developed to meet severe corrosion problems. The process enables the production of flattened pipe with the same cross-sectional area as a normal pipe, but the resultant tube is flattened to give an oval cross-section. This is important where space is at a premium—ships' ventilation ducting, for instance, which is sometimes bedded in insulating material. **Flexo Plastic Industries Ltd., South Chingford, London, E.4.**



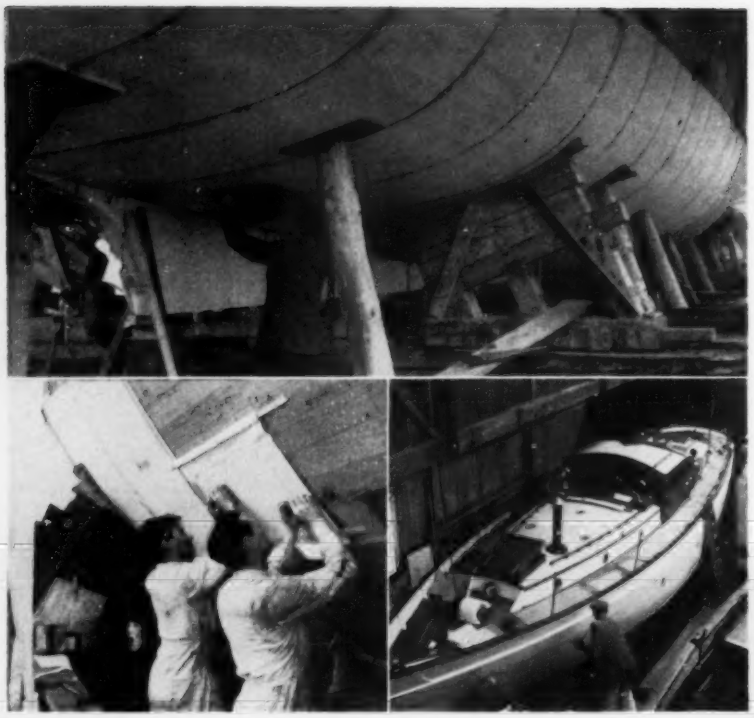
The company has built up a strong reputation in engineering plastics, producing components in nylon, ptfe, crosslinked polystyrene, Penton. Shown here are typical Polypenco Nylasint (nylon) pressed and sintered components. Also sells finely divided powders —vinyls, cellulosics, epoxies, etc.—for coating parts by the fluidized bed system. One of its latest products is Fluorosint filled ptfe, designed to improve ptfe's mechanical and thermal properties without materially affecting its electrical and chemical characteristics. For instance, its coefficient of thermal expansion is one-sixth that of ordinary ptfe, and is similar to that of aluminium, so solving problems of fits and clearances of parts due to thermal cycling. **Polypenco Ltd., 68/70 Tewin Road, Welwyn Garden City, Herts.**

Part of a consignment of Moseley A/151 nylon/cotton fire-resisting belting for use in the Dutch coalfields.

This is a 'premium' belt developed for work under arduous conditions where normal cotton belts are prone to early failure. The whole strength of the belt in both warp and weft directions is based on the use of high tenacity nylon yarns and a cotton 'filling' is used to give 'body' and stability. Tensile and tear strengths are considerably higher than a 5-ply cotton belt and impact resistance is said to be particularly good. At present there is no agreed impact test but A/151 retains a large proportion of its original strength after an impact sufficient to destroy a 5-ply cotton belt. The whole belt is impregnated and covered with a fire-resistant pvc composition. The range of products also embraces a wide range of industrial suction and delivery hose, plastic piping, roller coverings and rubber thread. **David Moseley and Sons Ltd., Chapelfield Works, Ardwick, Manchester, 12.**



Batco brand tap washers are used by leading water boards and tap manufacturers. Bath and basin plugs of the domed type, in black or coloured rubber, are fitted with chromium-plated triangles. Rubber rivets under the trade mark Flexi-rive continue to be made. They have been designed to join two articles together quickly, and in a slightly flexible manner. Among other lines exported are rubber-headed mallets with hickory handles. **Parlatex Ltd., Highbridge, Somerset.**

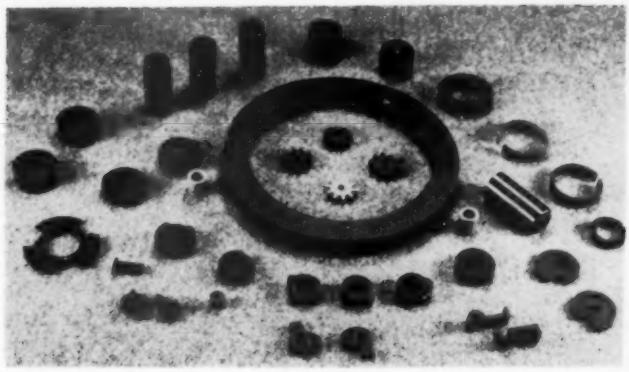


A wooden craft with a plastic sheathed hull, coach roof and deck goes a long way towards achieving the best of both worlds in boat building since it enables the boat builder to combine some of the advantages of both timber and plastics. The Cascover nylon sheathing process developed by the company utilizes three well-tried materials. The sheathing itself is a specially treated and woven nylon cloth. This is glued to the timber with a fully weatherproof resorcinol resin glue similar to the grades of Cascophen resorcinol glue approved by the Admiralty and Surveyors of Lloyds Register of Shipping. A vinyl resin finish is applied to thoroughly impregnate the nylon cloth after it has been glued to the timber. The Tropical Testing Department of the Ministry of Supply has carried out tests on sheathed material, reporting: 'Sheathing with either of two weights of nylon fabric, with or without vinyl resin finish, has protected African mahogany panels against shipworm (Teredo) attack for 49 weeks in raft trials at Port Harcourt, Nigeria. Unprotected panels were completely destroyed in this time'. (*Top*) Cascover sheathing being applied to the hull of HMS *Everingham*, an inshore minesweeper. Work was carried out by James Taylor (Shipbuilders) Ltd., of Shoreham. (*Bottom left*) A completed area of the hull of HMS *Everingham* after sheathing but before the application of the vinyl resin finish. (*Bottom right*) Cascover nylon sheathing protects the cabin tops of *Mia*, a 43-ft. motor sailer, built by A. H. Moody and Son Ltd., of Southampton. **Leicester Lovell and Co. Ltd., North Baddesley, Southampton.**

This extra light rubber Stick-a-Sole is walked on all over the world. Wafer-thin, it is made in a very wide range of sizes. Phillips also exports rubber long soles, heels, sheeting, heelgrips and arch supports, Beritex meteorological balloons and Beritex football bladders, to every corner of the world. **Phillips Patents Ltd., Western Avenue, Acton, London, W.3.**

One of the foremost rubber glove manufacturers, the company produces a wide selection in a variety of weights. It has an excellent export record—more than 50% of its output going overseas. Being worn in the picture are Marigold New Style gloves, one of the company's best selling lines. Suedette lined, they are also fluted so that they do not drop back on to the wrist. Another outstanding success is the Marigold Featherweight, designed for delicate work. **J. Allen Rubber Co. Ltd., Whitecroft, Lydney, Gloucestershire.**

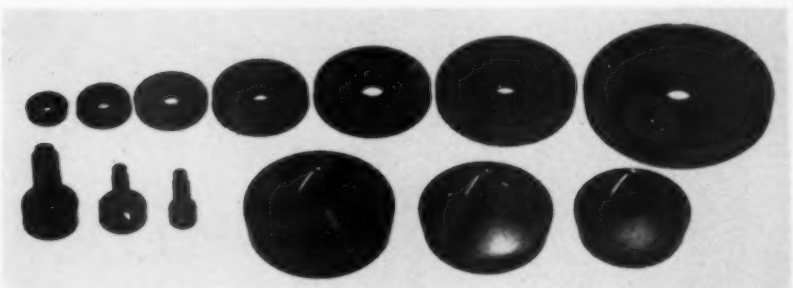
The company fabricates pipes like these and ductings in glass reinforced polyester. Pipes are produced with bore dimensions from 1½in. to 20in., in lengths up to 40ft. without joints. The wall thickness of the material can be varied between $\frac{1}{64}$in. and $\frac{3}{16}$in. By variation of weaves of glass fabric, *i.e.* square weave, satin weave, unilateral weave, pipes can be designed to give major strength characteristics to suit specific applications. In addition, by incorporating synthetic fabrics of the Terylene type, chemical and abrasion resistance can be developed to meet severe corrosion problems. The process enables the production of flattened pipe with the same cross-sectional area as a normal pipe, but the resultant tube is flattened to give an oval cross-section. This is important where space is at a premium—ships' ventilation ducting, for instance, which is sometimes bedded in insulating material. **Flexo Plastic Industries Ltd., South Chingford, London, E.4.**



The company has built up a strong reputation in engineering plastics, producing components in nylon, ptfe, crosslinked polystyrene, Penton. Shown here are typical Polypenco Nylasint (nylon) pressed and sintered components. Also sells finely divided powders —vinyls, cellulosics, epoxies, etc.—for coating parts by the fluidized bed system. One of its latest products is Fluorosint filled ptfe, designed to improve ptfe's mechanical and thermal properties without materially affecting its electrical and chemical characteristics. For instance, its coefficient of thermal expansion is one-sixth that of ordinary ptfe, and is similar to that of aluminium, so solving problems of fits and clearances of parts due to thermal cycling. **Polypenco Ltd., 68/70 Tewin Road, Welwyn Garden City, Herts.**

Part of a consignment of Moseley A/151 nylon/cotton fire-resisting belting for use in the Dutch coalfields.

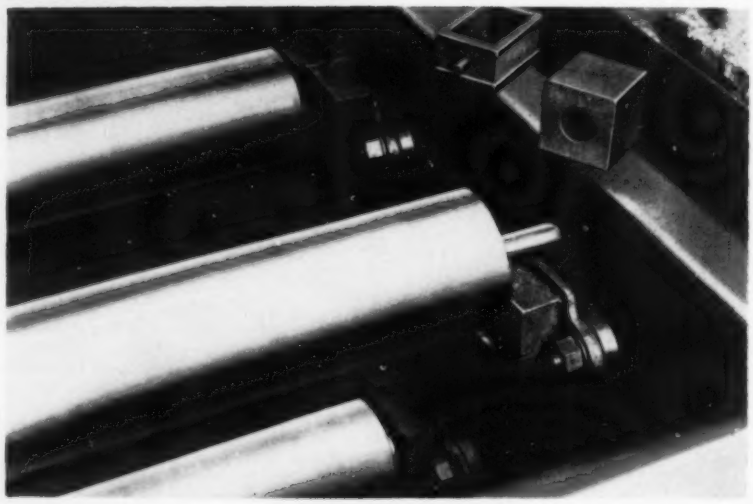
This is a 'premium' belt developed for work under arduous conditions where normal cotton belts are prone to early failure. The whole strength of the belt in both warp and weft directions is based on the use of high tenacity nylon yarns and a cotton 'filling' is used to give 'body' and stability. Tensile and tear strengths are considerably higher than a 5-ply cotton belt and impact resistance is said to be particularly good. At present there is no agreed impact test but A/151 retains a large proportion of its original strength after an impact sufficient to destroy a 5-ply cotton belt. The whole belt is impregnated and covered with a fire-resistant pvc composition. The range of products also embraces a wide range of industrial suction and delivery hose, plastic piping, roller coverings and rubber thread. **David Moseley and Sons Ltd., Chapelfield Works, Ardwick, Manchester, 12.**



Batco brand tap washers are used by leading water boards and tap manufacturers. Bath and basin plugs of the domed type, in black or coloured rubber, are fitted with chromium-plated triangles. Rubber rivets under the trade mark Flexi-rive continue to be made. They have been designed to join two articles together quickly, and in a slightly flexible manner. Among other lines exported are rubber-headed mallets with hickory handles. **Parlatex Ltd., Highbridge, Somerset.**

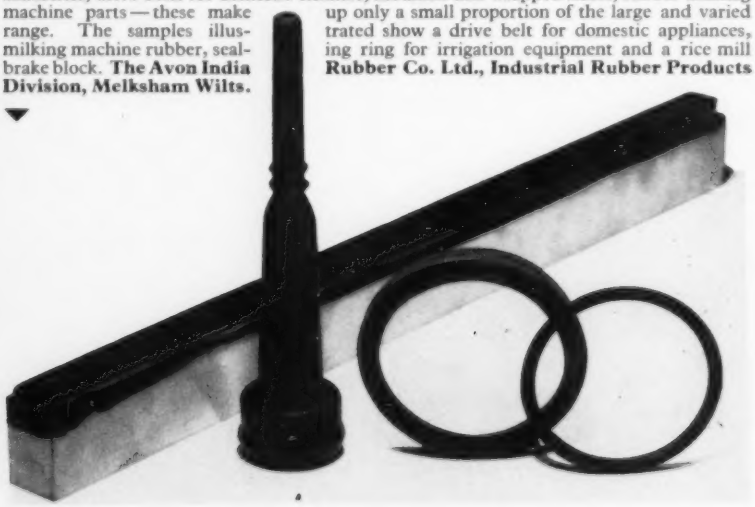
Goodyear rubber dock fendering is now used in 100 countries and is made in factories in various parts of the world. In the last 10 years more than £1m. worth of dock fendering has been exported from Britain. For customers abroad a comprehensive dock fender export brochure freely illustrated to show applications in such widely different countries as Greece, Cuba, Singapore, Nigeria, Ghana, Holland and Saudi Arabia is available. From small installations in India, America and Ceylon the Goodyear dock fendering export business has been widely expanded, the first sale abroad being in 1935 for Colombo harbour, which, when inspected more than 15 years later, was still in first-class operating condition. **Goodyear Tyre and Rubber Co. Ltd., Export Department, 17 Stratton Street, London, W.1.**

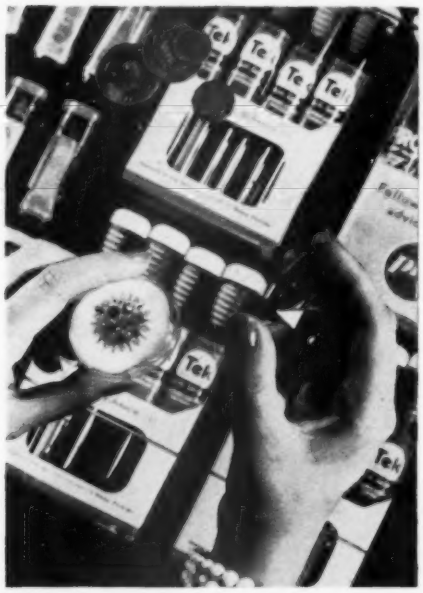
One of the UAM group of companies, Allied Structural Plastics was formed in January this year to produce plastics materials for the building industry. The latest product of the company is the Aspect rainwater system, unplasticized unmodified pvc, for flat and pitched roofs and balcony drainage. All joints are of the push-fit or snap-fit type and neoprene sealing strips are fitted to gutter joints. The company has also recently introduced a range of corrugated and flat pvc sheeting. Another company in the group — UAM Plastics Ltd. — makes Unilux corrugated sheeting in glass-reinforced polyester resin. **Allied Structural Plastics Ltd., Dunstable, Beds.**



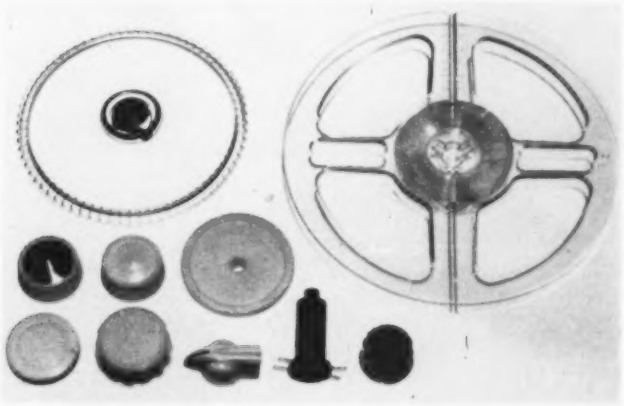
These dye jig bearings of Tufnol last five or six times longer than the metal bearings which they replace and do not wear the steel journals. Tufnol is available in sheets rods, tubes, angles and channels and is widely used for bearings and other applications. **Tufnol Ltd., Export Department, 131 Victoria Street, London, S.W.1.**

The use of synthetic and natural rubber for exacting individual requirements has long been a speciality of the company. Mouldings and extrusions for the aircraft and motor industries, drive belts for domestic cleaners, moulded and wrapped hoses, rubber milking machine parts — these make up only a small proportion of the large and varied range. The samples illustrated show a drive belt for domestic appliances, milking machine rubber, sealing ring for irrigation equipment and a rice mill brake block. **The Avon India Rubber Co. Ltd., Industrial Rubber Products Division, Melksham Wilts.**





Products which depend on display have a sparkling new sales appeal in the latest plastics containers introduced by the company. Called Flat-Packs to identify their slender, handy disc shape, they are made from continuously extruded cellulose acetate, which is then machine pressed into the required dimensions. Tops and bases are manufactured by this means along separate production lines. In use these two sections simply inter-close to form their own safe grip. Flat-Packs can be smooth or multi-faceted like jewels, adding glamour and attractiveness to product visibility. Many variants in design and colour are available. Crystal clear and lustrous colours are offered, with attractive decoration and printing if required. **Packaging Department, Formica Ltd., Buckhold Road, London, S.W.18.**



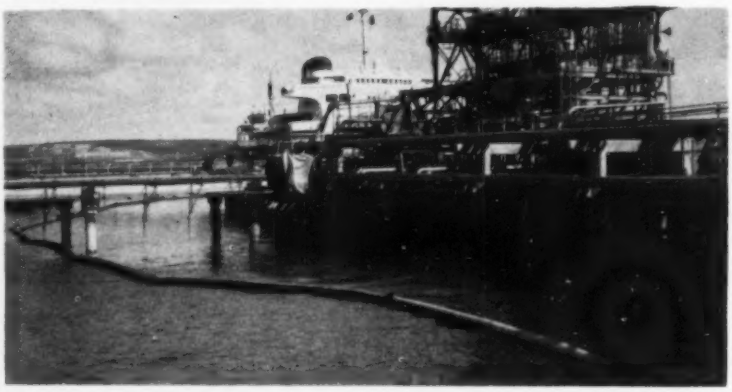
The company has for many years supplied the radio industry with acoustical products and these have recently been augmented by an increasing range of mouldings, including a selection of knobs, dials and edge knobs, as well as many proprietary mouldings for individual customers. Cosmocord has been known for many years as trade moulders, mainly for thermosetting materials in diverse fields of industry. The new range of radio parts is largely injection moulded and this side of the business is being considerably expanded. Escutcheon plates, cover plates and many associated items are currently being moulded. **Cosmocord Ltd., Eleanor Cross Road, Waltham Cross, Herts.**

The company manufactures an extensive range of solings in which the variety of colour and substance available encourages easy adaptability to modern shoe styling, combining lightness and flexibility with extra durability. Atlas hard top-piecing sheets, cellulose or buffed back, are made in a range of colours for ladies' fashion heels. Moulded rubber soles and heels for sports and spectator sports footwear include the Ridgeway 94% quality illustrated, which continues a popular choice. Dainite washable and unbreakable rubber buttons are available in white and colours for all washable garments and in varied designs and colours for outer knitwear. **The Harboro' Rubber Co. Ltd., Dainite Mills, Market Harborough.**

Part of 500 tons of conveyor belting for Russia being prepared for press vulcanization at the Dunlop Belting Division factory at Speke, Liverpool. Covered with special abrasion-resistant rubber compound for carrying ferrous and non-ferrous ores, the 6½ miles of belting has an average width of 79½in. and is approximately 1¼in. thick. The fabric has up to 14 plies of Terylene and has a nylon wrap-round cover. This is a typical example of the large export orders received for the wide range of conveyor beltings produced by the company. **Dunlop Rubber Co. Ltd., Belting Division, Speke, Liverpool.**

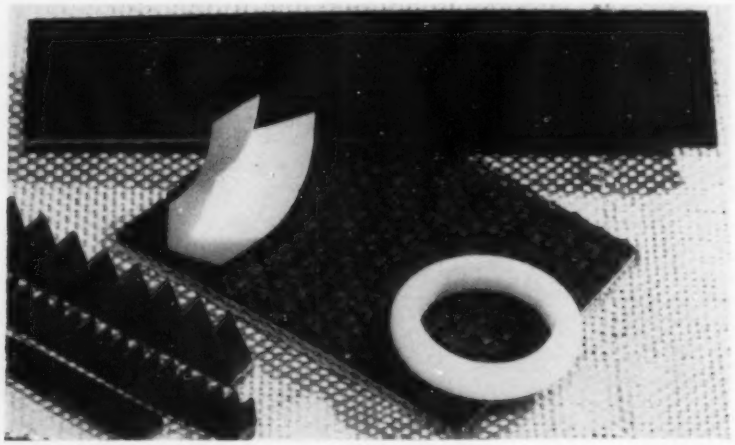
Warne patented floating booms are providing a solution to the problem of oil spillage when transferring oil and petroleum products from ship to shore and vice versa. The boom consists of a neoprene tube reinforced with a synthetic fabric; a weighted skirt about 22in. deep hangs down from the tube to prevent oil being swept beneath it. The boom is manufactured in 50ft. or 25ft. sections; any number of these can be connected up to provide the length required. Inflation is to a pressure of 1½/2psi. At this pressure the boom is flexible and capable of following wave contours easily. Five major installations have already been carried out in the UK and a 700ft. long 16in. boom, now on order, is soon to be installed at a leading European oil terminal. (The tube is in two sizes, 8in. or 16in. diameter, the larger being used for rough water conditions.) Also manufactured are fabric and wire braid reinforced hose, rubber surgical instruments, rings, extruded sections, tubing, textile thread and tape, flooring and rubber bands. **William Warne and Co. Ltd., India Rubber Mills, Barking, Essex.**

Easykleen products in the picture are a watering can rose, a rubber mat—manufactured in four sizes, draught excluders and a Poppin holder (extreme right) which will hold anything from a towel to a mop. The rose has a rubber body and is of solid copper; it has established a large export outlet for itself, finding sales particularly in the tobacco-growing industry. **B. and W. Patents Ltd., Tillgray Works, Booths Hill Road, Lymm, Cheshire.**



The five factories of London Rubber, employing more than 2,500 people, comprise one of the largest latex dipping and manufacturing plants in the world. These factories produce a wide range of surgical products, including surgeons' gloves, suregrip house gloves, ariel balloons and toyshapes, etc., which are sold in more than 80 countries throughout the world. A popular line marketed by one of the company's subsidiaries, Lewis Knight and Co. Ltd., is the Huckleberry Hound series of balloons; printed in two colours. Sprouting from the special balloon pump is Yogi Bear. **London Rubber (Industries) Ltd., Hall Lane, Chingford, London, E.4.**

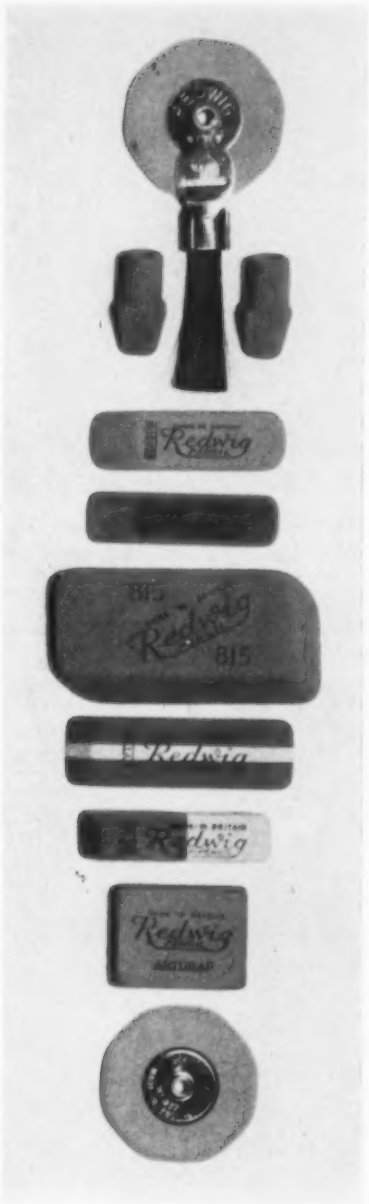
A member of the giant Turner and Newall group, the company's products range from ptfe products—including gaskets, expansion joints and veneered tape—to belting. The background to this picture is Duraglas glass fibre for reinforced plastics: resinated asbestos moulding materials are also manufactured. Poly-V belt drive profiles are pictured: this drive is described as a perfectly matched set of premium quality heat and oil resistant industrial V-belts which are joined together at the shoulders, forming one solid unit. The belt runs in specially grooved pulleys and its ribs completely fill the grooves during embrace. Poly-V drives are protected by Patent and can be exported to all countries except France and the Americas. **Turner Brothers Asbestos Co. Ltd., P.O. Box No. 40, Rochdale, England.**



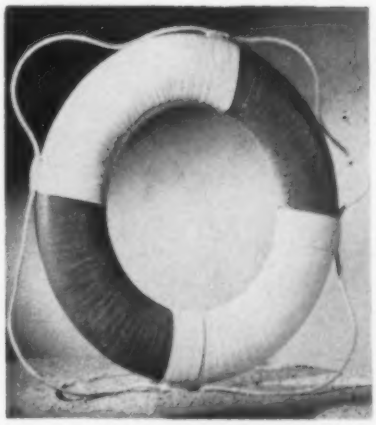
Perrite is a member of the Harvey group of companies, which specializes in the manufacture of components for the footwear industry. Products include solid and sponge compounds for the direct vulcanization process, soling sheets in natural and resin rubber, unit and combine soles, long soles and half-soles, heels and phenolic resin top-piece sheeting. Mechanical lines include gaiters, gaskets and engine mountings. The bootee illustrated has been soled with white vinyl and the two slippers with Perrite sponge compound and skin. **Perrite Ltd., Weldbank Rubber Mills, Chorley, Lancs.**

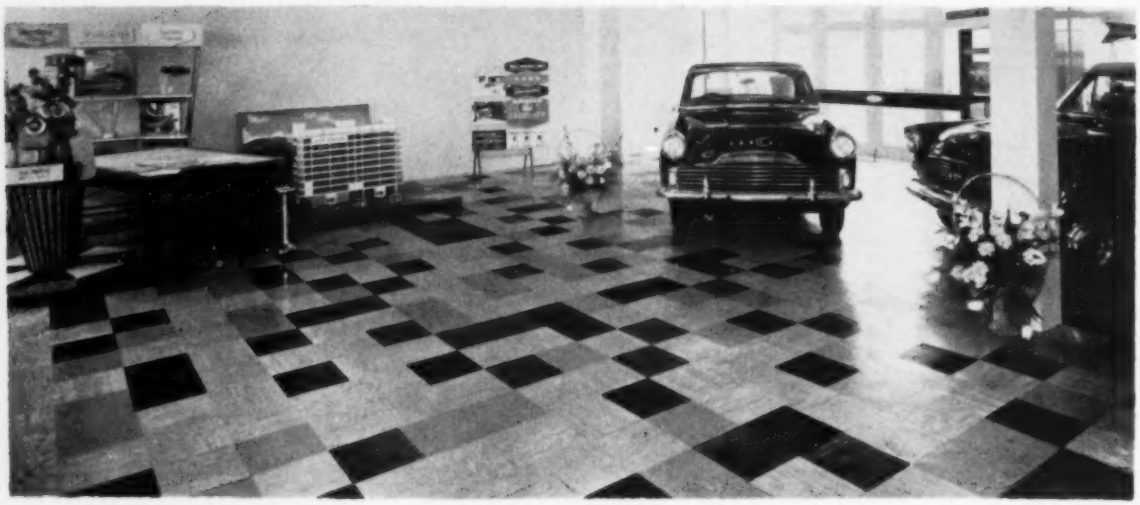
Over the past three years the company has developed a chemically-bonded material consisting of unplasticized pvc with an exterior bonded securely to it of polyester resin reinforced with glass-fibre. The tank shown in this photograph, about to be delivered to a major dry battery manufacturer in England, is of 3,000gal. capacity. Its internal diameter is 5ft. 6in. and its overall length is 21ft. It is to be used to store zinc chloride solution at temperatures up to 90°C. Tanks with capacities from 50 to 10,000gal. are now being sold to a number of countries overseas. **Tough Plastics Ltd., Byfleet Road, Addlestone, Surrey.**

After 50 years' experience in the manufacture of erasers the company is now one of the leading specialists in this field. All the points which go to making a fine quality eraser are carefully watched. Redwig erasers are now being asked for in many parts of the world and the wide range covers demands from schools, offices, studios and drawing offices. The company also specializes in the manufacture of sheet, valves, washers, strip, extruded goods, tubings, small moulded goods and respirators. Exports are made to Africa, Australia, Pakistan, Scandinavia and many other countries. **J. E. Baxter and Co. Ltd., Leyland, nr. Preston, Lancs.**



One of the company's largest exports is Onazote for low-temperature applications. Other products which go overseas in large quantities are Rubazote thermal insulation tubing, particularly for the Scandinavian market, where it is used very extensively in the manufacture of deep-freeze cabinets, and Onazote lifebuoys, which are used by many leading shipping companies throughout the world. This B.700SW lifebuoy is exported in fairly large quantities to New Zealand, Hong Kong, South America, South Africa and Malaya and other countries throughout the world. **Expanded Rubber Co. Ltd., Mitcham Road, Croydon.**





Both plastics and rubber flooring are manufactured, including the Riltile range of thermoplastic tiles, the new Rilflex range in a selection of bright modern colours, Britannia vinyl flooring, the Autotile special flooring for motor car showrooms and Viscount inlaid vinyl flooring. This latter product is a new development in which a specially designed printed pattern is incorporated in the manufacture of flooring, giving luxurious appearance and texture. Viscount flooring is made in eight designs and over 32 specially selected colour combinations. The sweep of flooring shown is in a Woolwich showroom and is made up of Autotiles. **British Mouldex Ltd., Rilex Works, Wellingborough, Northants.**

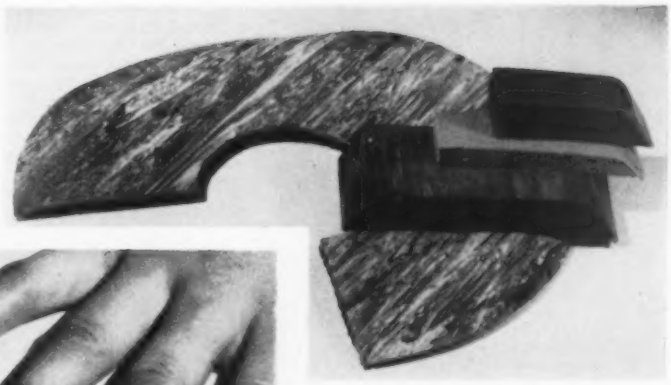
Skived-down sample of the company's new spira-braid hydraulic hose. Sizes are from ¼in. to 1¼in. id. Improvements claimed for the hose include higher burst pressures, less movement under pressure and better lining and cover adhesion. The pressure surge is held by two layers of high-tensile wire

which are spiral wound instead of braided. These are held in place by two conventional braided layers. The burst pressures range from 24,000psi for the ¼in. size to 7,000psi for the 1¼in., but it is customary for the normal operating pressure not to exceed a quarter of the burst pressure. **Electric Hose and Rubber Co. Ltd., Amalgam Mills, Harpenden, Herts.**

A flourishing section of the company's business is baby products. This young madam shows that Dress Up Pants are too good to hide. They are lined with extremely soft vinyl sheet. **Playtex Ltd., P.O. Box 5, Playtex Park, Port Glasgow, Scotland.**

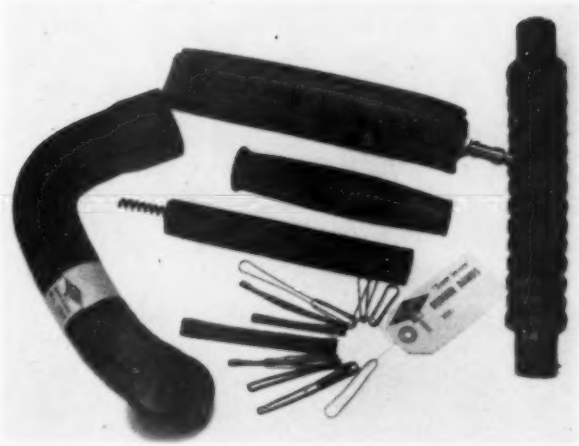
A wide range of products, including moulded mechanical rubber goods for industrial purposes, rubber brushes for suede shoes, kitchen utensils, composition soling, flooring tiles and orthopaedic pads and wedges. Shown are rubber wheels for trucks and trolleys, a backing disc for a power tool and rubber suede shoe brushes. **Emsa Rubber Works Ltd., Paterson Street, Blackburn, Lancs.**

The company is a specialist in the manufacture of sponge rubber. Airtred sponge-backed solid rubber is available in 36 colours and varying thicknesses. It is a good floor covering where silence is essential; it is also hard wearing and therefore ideal for offices, hospitals, luxury coach centre runners, dental chair surrounds, etc. Solid rubber flooring is also made in the same range of colours. **The St. Albans Rubber Co. Ltd., The Camp, St. Albans.**



The company primarily manufactures rubber bands and its Mermaid trade mark is known all over the world. Illustrated are some less well-known Mermaid products—finger cones and a very efficient ice mould. **Caton Ltd., Mermaid House, 70 Thomas Street, London, S.E.1.**

This shattered coach graphically illustrates the toughness of the company's pvc leathercloth. When the French ammunition ship *La Coubre* exploded in Havana, Cuba, a number of coaches on the quayside nearby were severely damaged. Nine of these were shipped back to Britain for repair. Assessors studying the damage saw that blast, burning debris and falling masonry had shattered the windows, buckled the doors and breached the coachwork. But the Melloroid pvc leathercloth used as upholstery fabric for the seating had come through almost unscathed, apart from a few punctures and some charring. The Melloroid fabric, a low-flammability upholstery material made with Geon pvc, had acted as a fire blanket. When cushioning material had been gutted, the Melloroid had been charred, but remained largely intact. A spokesman for the exporting company claimed: 'After a quick dust over, most of the leathercloth was as good as new'. Besides leathercloth, the company makes protective clothing and a full range of materials for the shoe trade. **Mellowhide Products Ltd., 26-28 Great Portland Street, W.1.**



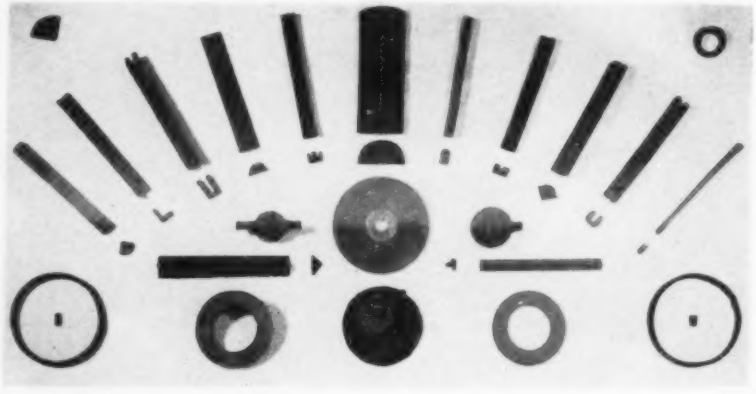
The company exports a varied range of extruded and moulded rubbers, under the trade name Britannia, for the motor, motor-cycle, cycle, perambulator, sports and stationers' trades. Products include 'shaped' radiator hose connexions (the range is one of the most comprehensive and covers all popular British cars), various hoses, cycle covers and tubes, grips for cycles, motor-cycles, perambulators, hockey sticks and cricket bats, rubber bands and washers. Special extrusions, hoses and moulded rubbers are manufactured to clients' requirements. The illustration depicts a bundle of mixed sizes of rubber bands, a cycle tube, a shaped and a convoluted radiator hose, a rubber grip and a section of spiral wire perambulator tyring. **The Lee-Healey Co. Ltd., Marlow Road Mills, Marlow Road, Leicester.**

In addition to its wide range of rubber and pvc fire-resistant conveyor belting, the company offers a range of man-made fibre belts under the trade name Nypac. Designed to meet the increasing world-wide demand for high-tensile conveyor belting, these belts are nylon wefted and are combined with either cotton, rayon or Terylene, according to the tensile strength required. The belts have higher safe working stress values, better impact resistance and less weight than conventional cotton belts. They also have greater flexibility, better troughing characteristics and more resistance to longitudinal tearing. Over 10 miles of 30in. wide Nypac belting has been supplied to the National Coal Development Corporation in India. **BTR Industries Ltd., Belting Division, Herga House, Vincent Square, London, S.W.1.**

Exterior grade decorative plastic laminates have been used on the front spandrel at three levels of this modern block of flats by New Ideal Homesteads Ltd., of Epsom. Striking and pleasing effects can be achieved by the outside application of Formica decorative laminates. The new exterior grade, produced in Formica Beautyboard as well as in the standard veneers, is available in many of the popular Formica colours and patterns. Heat, moisture, impact and fade resistant, the laminates can be kept in perfect condition simply by wiping over with a damp cloth — as swiftly and as effectively as the windows are cleaned. **Formica Ltd., De La Rue House, 84/86 Regent Street, London, W.1.**

The Puck range of plastic boat and yacht equipment made by the company has recently been extended by the addition of this rescue float. This is made of vinyl material, coloured bright red, and is designed to keep a life-line visible to a person in the water. A pvc-coated cord is fitted for attachment to a line and this forms a loop, enabling the distressed person to secure a firm grip. **Grovewell Ltd., 656 Forest Road, Walthamstow, London, E.17.**

Sponge rubber requirements for every field of industry are a speciality of the company, which is also well known for its rubber and resin rubber shoe soling, available as sheet and as moulded units. Products illustrated include gaskets and profile sections made from Volacel expanded sponge rubber, widely used in the manufacture of cars, aircraft, radio and television sets and refrigerators. The company also specializes in sponge rubber gaskets, mouldings and sheeting. **Volcrepe Ltd., V.C. Works, Glossop, Derbyshire.**



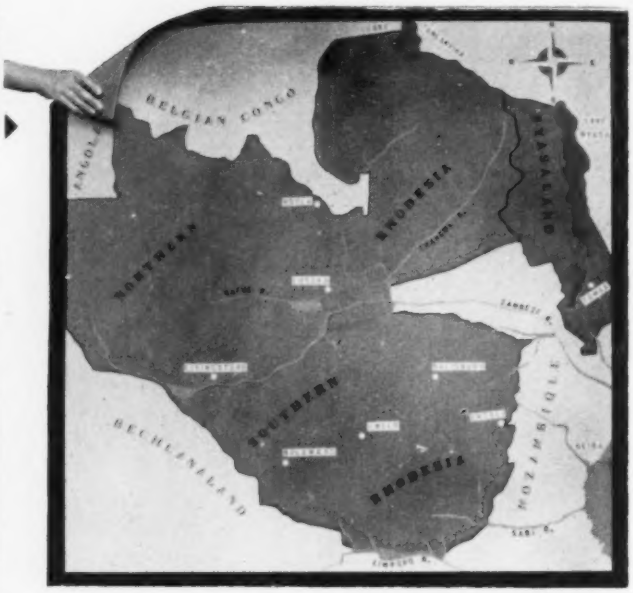
The production of three-dimensional mouldings for vehicle and domestic appliance badges, name plates, control panels and display signs and advertisements is one of the specialities of the company. An acrylic moulding for a Hotpoint refrigerator is seen being removed from an injection-moulding machine prior to spraying or metal deposition. **Wilmot Breeden Ltd., Amington Road, Birmingham, 25.**

This doll, made by Rosebud Dolls Ltd., using Geon pvc, is one illustration of the multitude of uses which the material finds in many industries in nearly every country in the world. Geon pvc is manufactured by **British Geon Ltd., Devonshire House, Piccadilly, London, W.1.**

Illustrated are some of the company's range of baby soothers, baby bottle teats, valves, eye-droppers, Moorfield teats, Vaxine caps, etc., in many different shapes. These items are marketed under the name of Hushabye. On the right is shown one of the firm's dolly outfits, consisting of dolly soother, feeding bottle, hot-water bottle, potty and pants. **P. H. Douglas and Co. Ltd., 16 Commercial Street, Cheltenham.**

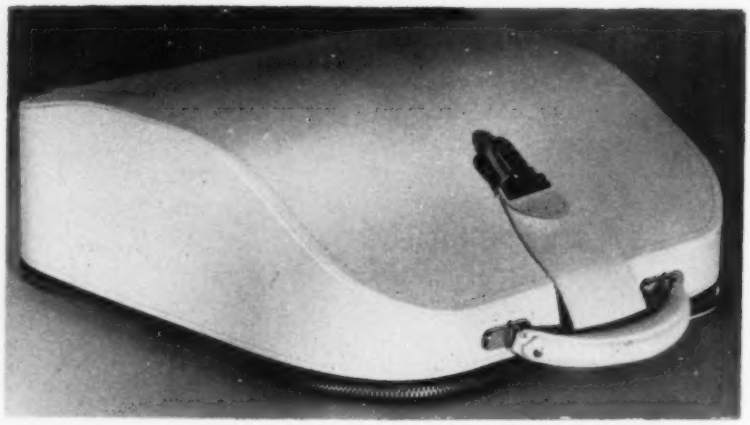
The Cross Rib truck tyre is one of the comprehensive range of tyres manufactured by the company for export. The range includes motor car, truck, earthmover, agricultural and scooter tyres. Goodyear has the greatest range of truck tyres in the world, with a wide variety of tread designs, depths and sizes and choice of carcass construction — in 3-T nylon, 3-T rayon or steel. **Goodyear Tyre and Rubber Co. (Great Britain) Ltd., Export Department, 17 Stratton Street, London, W.1.**

This MacLellan mat gives a good idea of the versatility and artistic scope of rubber flooring and can certainly be said to have been tailored for export. It was specially made for a Rhodesian bank. Hand-built in six different colours, it accurately portrays the Central African Federation. **George MacLellan and Co. Ltd., The Glasgow Rubber and Asbestos Works, Shuna Street, Maryhill, Glasgow, N.W.**

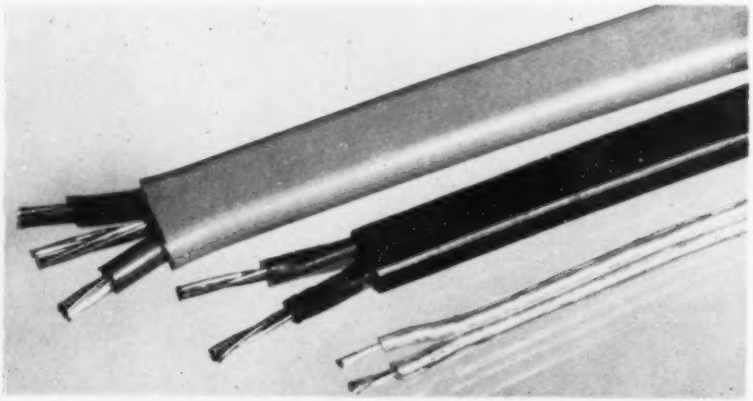


Precision rubber mouldings in the picture are produced in natural, oil-resisting synthetics and silicones (gaskets, grommets, 'O' rings and seals of various cross-sections). Mouldings with metal inserts and a range of extrusions are manufactured. Also shown is an advertising model (cast) and, as an example of the company's seamless latex products, a Beritex football bladder. **Guide Bridge Rubber Co. Ltd., 250 Western Avenue, Acton, London, W.3.**

A leading UK exporter of pvc-coated fabrics, the company's Everflex fabrics are used for upholstery, murals, hooding, travel goods, golf bags, panelling, bookbinding, folding doors and cinema screens, plus a range for protective clothing. One of its latest products, Cirrus, is a microcellular vinyl with a special abrasive-resistant finish and excellent soil-retarding properties, coated on to a knit-back fabric. This gives exceptional feel, stretch and handle without additional weight, making it a fashion material for coats, jackets and casual wear. The typewriter case shown is in Everflex Cream Antique CR2A/1/XF/32 fabric. **Bernard Wardle (Everflex) Ltd., Peblig Mill, Caernarvon, North Wales.**



This group of companies manufactures and ships to all parts of the world a wide range of electrical and non-electrical products which are produced in its various factories by compression and injection moulding and extrusion. It is one of the largest manufacturers in the UK of electrical accessories and wires, cables and flexibles for all electrical purposes, the latter being manufactured with pvc, polythene or rubber insulants. Plastic extruded dress belts in various designs are produced in large quantities. **Ward and Goldstone, Pendleton, Salford, 6.**



Kitchen equipment of all kinds is manufactured by this member of the P. B. Cow group. This polythene pedal bin has a spacious inner liner of over 2½ gal. capacity. The lid locks in an open position, and the bin is in two colours. The range includes bowls, buckets, bread bins and many injection-moulded components to order. **London Moulders (Plastics) Ltd., Buckingham Avenue, Trading Estate, Slough, Bucks.**

Products include the new high-temperature, high-pressure, non-corrosive Epoch pipe system made from filament-wound glass and epoxide resins to meet the requirements of the oil, chemical, atomic energy, paper, food and other similar industries, together with cylindrical storage tanks. In the commercial field the company remains allied to transportation by the manufacture of boat hulls, car bodies and motor-cycle shields, where design is closely tied to high-class engineered structures. Here a chemical storage plant is being delivered. Originally developed for the United Kingdom Atomic Energy Authority, a number of these tanks are installed at Harwell to store radioactive effluent. **Bristol Aeroplane Plastics Ltd., Filton House, Bristol.**

The brake lever gaiter (top) is typical of the wide variety of gaiters and bellows made for the car industry. The most complicated designs can be made to close tolerances. The selection of Prescollan polyurethane components in the bottom picture includes a machine tool slideway wipper, roller, hammer head, gear wheels, bellows and a conveyor pad. **John Bull Rubber Co. Ltd. (Mechanical Products Division), Evington Valley Mills, Leicester.**

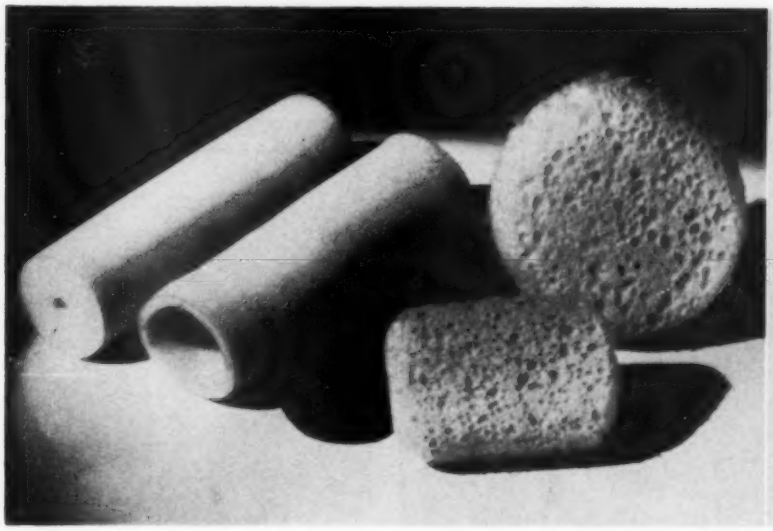
The Avon India Rubber Co.'s range of inflatable rubber dinghies are virtually unsinkable, being made of Avon's new synthetic rubber-proofed weather-resisting fabric, specially toughened to give extra long life. Yet each one can be packed in a kitbag or stowed in the boot of a car and is ready for use in 11min. With an outboard motor these craft give yachtsmen of every degree of experience all they demand of a dinghy without the usual drawbacks of conventional hard boats. Illustrated is the Redstart, an 8ft. dinghy. **The Avon India Rubber Co. Ltd., Marine Division, Melksham, Wilts.**

America started the vogue for expanded vinyl fabric and until recently large quantities were imported into this country. In the last few months, however, Storeys, of Lancaster, has been one of the British manufacturers to break into this market and their material, Neolan 350, is now made in a wide range of colours. The process of expanding or aerating the vinyl produces exceptional suppleness and the knitted fabric gives a considerable degree of elasticity in both directions. The soft leather appeal gives articles made in Neolan 350 not only an excellent handle, but conveys the impression of elegant good looks. This has meant that, for the first time, a plastic fabric is being used by first-class couture fashion houses for coats, suits and handbags. The model is wearing clothes designed by students of the Royal College of Art to show the potentialities of expanded vinyl as a fashion material. **Storeys Ltd., White Cross, Lancaster.**

Penfold golf balls have been praised throughout the world for their consistent performance and high quality. They are manufactured in the British and also the controversial American size. They can be used as advertising gifts by having the company's name imprinted on the equator line of the ball. **Golf Ball Developments Ltd., Bromford Lane, Ward End, Birmingham, 8.**

Feltite $\frac{1}{16}$in. id draught excluder tubing is made up in 60ft. and 16ft. coils, the latter being sufficient for one door frame, and is available in four colours: brown, green, cream and mushroom. Feltite 32in. long draught excluder strips are manufactured in a standard length, which can easily be cut to fit any interior house door. They are a companion line to the Feltite tubing and are available in the same four colours. A successfully introduced new line is $\frac{1}{16}$in. id all-plastic draught excluder tubing, available in 60ft. coils. **Ardray Manufacturing Co. Ltd., 96/100 Aldersgate Street, London, E.C.1.**

This company specializes in rubber products for the boot and shoe trade and for engineering industries. Pictured is a small selection of items which are in regular production. An extensive range of heels, soles, stick-on soles, tips, sheets of soling and top-piecing material are available in many different designs in black and brown in natural rubber, and also in Maxilite, a resin rubber with extra wear-resistance and decreased weight. Moulded mechanical rubbers are made to customers' special requirements, but, in addition, large stocks are carried of standard lines, such as grommets, walking-stick pads and components for the commercial vehicle industry. Advice on the use of mechanical rubbers for difficult and unusual applications is readily available. **Duramax Ltd., Marlborough Works, Marlborough Road, London, N.19.**



Declon Sponges Ltd. manufactures a large range of foam plastics articles. The seamless rollers illustrated are made in practically any required size and are used in a number of industries, in addition to their use in paint rollers and carpet shampoo applicators. The firm also makes sponges rectangular in shape, as well as oval and round, and with or without bevelled edges. In addition to these two lines, they can supply polyurethane flexible foam plastic in almost any shape and can also bond foam to pvc, board, etc. **Declon Sponges Ltd., 1b Dyne Road, London, N.W.6.**

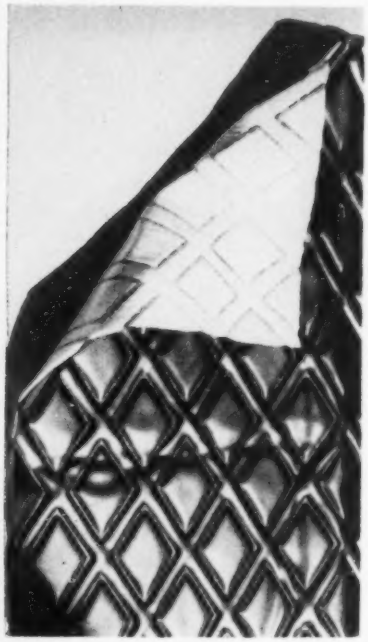
This instantaneous electric water heater is manufactured by I.C.G. Ltd., The Pantiles, Tunbridge Wells, using a number of mouldings produced by Kent Mouldings Ltd. The heater was specially designed to make the fullest use of plastics—it contains 18 mouldings from 15 different tools. Bakelite X13080 material was chosen for all parts coming into contact with water and carrying electrical terminal connexions. The heater cover is moulded in Cellidon cellulose-acetate-butyrate and is fitted with a red acrylic cover for the neon heat indicator. Urea is used for the control knob; the valve jumpers and valve head washers are moulded in nylon. The heater is available at 3 and 4kW. ratings for 225/250 volts and 3kW. rating for 200/250 volts a.c. Mouldings by: **Kent Mouldings Ltd., Footscray, Kent.**

The company, besides its enormous range of tyres, produces in this country rubber-to-metal bonded parts, vibration dampers, engine mountings, tyre accessories, etc. Illustrated is one of the most popular tyres produced at Brentford. It is the Firestone Town and Country, a rear-wheel tyre for motor cars that was developed some years ago to give extra grip and traction on the rear wheels of a motor car in mud, slush, rain or snow. It was the original tyre of this kind and it is available in a wide range of sizes, tubed or tubeless. Tyres roll out from Brentford for cars, commercial vehicles, buses, tractors, motor cycles, earth-moving machines and aeroplanes. **Firestone Tyre and Rubber Co. Ltd., Great West Road, Brentford, Middx.**

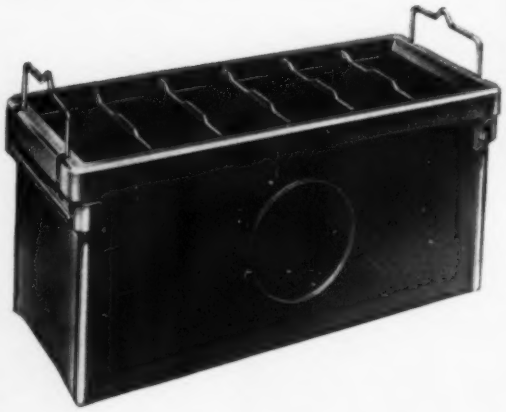
One of this very large rubber company's new products is a safety boot (left) with the double protection of a steel toe and a fluted green rubber vamp, made to a very high specification as required by electricity and gas boards. It has also been successfully tested by manufacturers of diving suits, having become standard with one of the main manufacturers. Another new product is the 'moulded' boot (right) made unlined for ease of washing inside and out. It is recommended for food factories and meets the requirements of the Pure Food and Drugs Act. The company also produces proofed clothing, electric cables, sheeting, hose, belting, stair nosing, mechanicals, etc. **Greengate and Irwell Rubber Co. Ltd., Greengate Works, Manchester, 3.**

The new American Trade Centre, St. James's Street, S.W.1, has plasterboard partitioning faced with Plastolam vinyl sheeting. This is specially designed for cladding hard flat surfaces including metal and other non-absorbent surfaces and absorbent materials such as leather, plasterboard and plywood. Laminates faced with Plastolam have excellent resistance to oils, solvents and staining, and are abrasion resistant. **Storey Bros. Ltd., White Cross, Lancaster.**

As in other trades, continental designs have had considerable influence in the shoe trade. Sussex Rubber's Napoli soles show this influence and are made in delicately patterned resin rubber for use on ladies' fashion shoes and bootees. The Napoli is available in a range of five colours including two translucent shades. The Veldt unit pictured here is simple in design and is manufactured in tan, black and translucent grades. **Sussex Rubber Co. Ltd., School Road, London, N.W.10.**



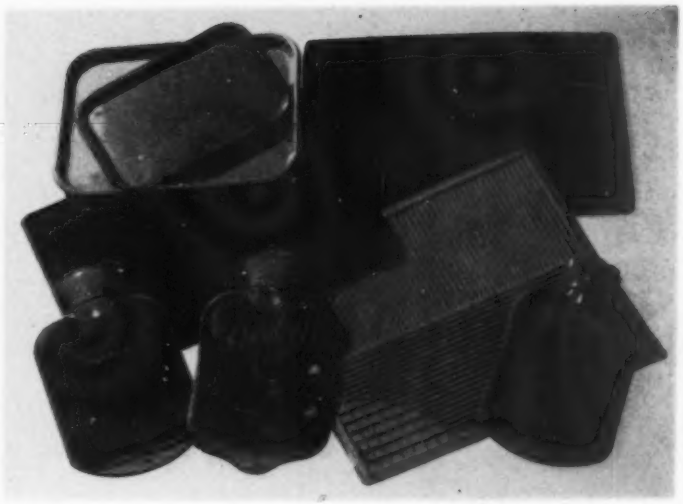
Latest and largest addition to the range of lightweight starter battery containers made by the company is this model 6L13H designed to continental specification for Mercedes cars. The container is made in hard rubber with completely plain surfaces. This throws the central medallion, where the battery maker's name will appear, into sharp relief. In the past few years over a quarter of a million battery containers have been sold for service all over the world. **United Ebonite and Lorival Ltd., Little Lever, Bolton.**



Although the principal export product of the company is flame-proof conveyor belting, Rubber Improvements makes a wide range of other products. A recent product is a self-adhesive grade of Rilquilt quilted pvc, which does not require sticking or tacking. Rilquilt is made in three quilting depths, in three quilting patterns and in a range of over 30 colours which include attractive pearlised finishes. **Rubber Improvements Ltd., Rilex Works, Wellingborough, Northants.**

Manufacturer of a wide range of rubber and plastics products, P. B. Cow is probably best known for its range of Li-Lo airbeds and other inflatables. The Carnival airbed pictured here is made in attractive candy stripe material in red/white, green/white and blue/white. Vogue and Venetian airbeds are made from two-ply heavyweight laminated sheeting in contemporary printed design and the Inflatable raft is fitted with a compass and see-through panel. **P. B. Cow (Li-Lo) Ltd., Liverpool Road, Trading Estate, Slough, Bucks.**

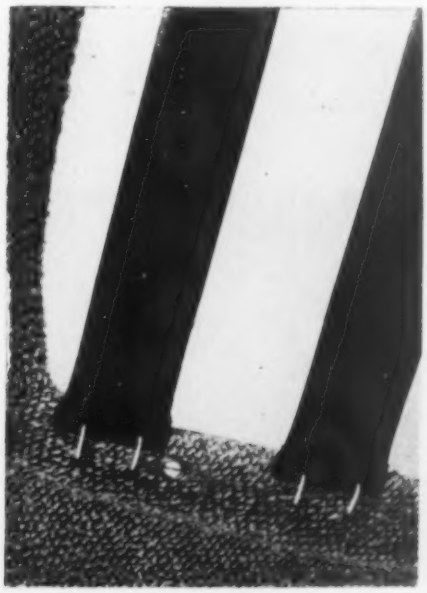
In the last 12 months the export sales of the company have doubled, and its products are exported to many overseas markets. Among the products introduced within the last year is a range of thin wall flexible ptfe tubes in bore sizes from ¼in. up to 2in. Development work is also taking place on 3in. and 4in. bore sizes. A complete range of re-usable end fittings is available for these bore sizes and the hoses, when braided with stainless steel as shown in the photograph above, can be used for conveying a wide range of corrosive chemicals, and liquids including oil, hot water and steam. **William Rose Ltd., Hilyn Works, Lockfield Avenue, Brimsdown, Middlesex.**

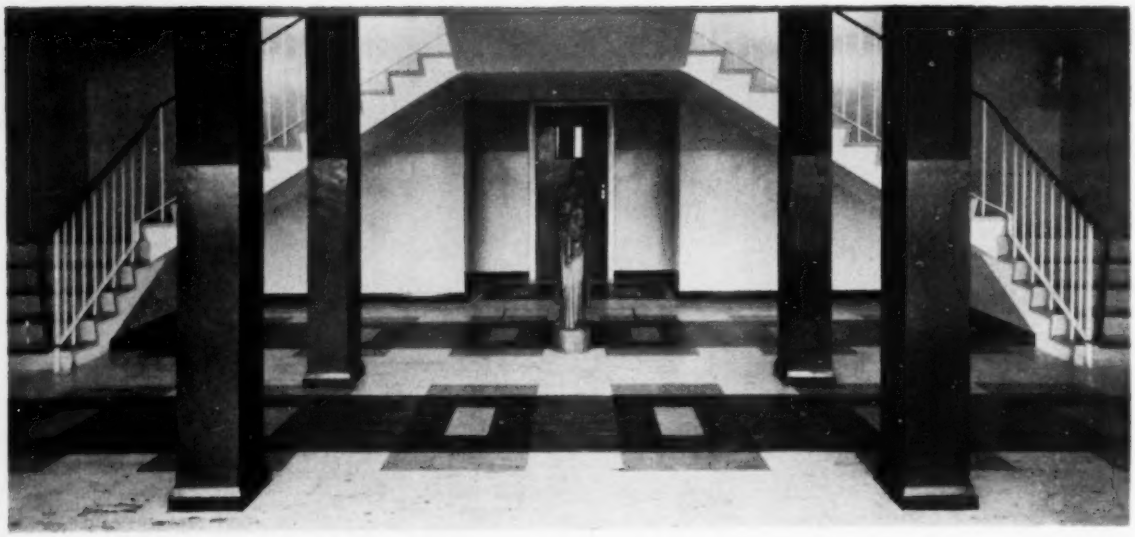


The company manufactures a wide range of mats in attractive finishes for overseas markets for car and domestic use. The multi-purpose brush pile mat can now be supplied with the customer's name moulded in the centre. The range of rubber trays has been extended by the addition of an 18in. x 14in. model. This is heat-resistant and can be washed in boiling water or steam without distortion. World markets are catered for with over 50 designs in hot water bottles, the latest addition being the Cannon 77, a bottle with a cloth cover applied by a patented process. **The Cannon Rubber Manufacturers Ltd., Cannon Works, Ashley Road, Tottenham, London, N.17.**

The company provides a moulding service to industry which includes all stages in the process from the design and manufacture of the mould tool to the production of moulded articles. Fraser and Glass make a wide range of products by injection moulding, compression and transfer moulding and blow moulding. With 40 years' experience behind them they are well equipped to keep their customers at home and overseas abreast of all developments. Technical service facilities are offered on all aspects of moulding, ancillary processes and allied techniques. All enquiries are routed through the technical service department, and recommendations made, where necessary, for alternative design features to ensure a high quality product. **Fraser and Glass Ltd., Woodside Lane, N. Finchley, London, N.12.**

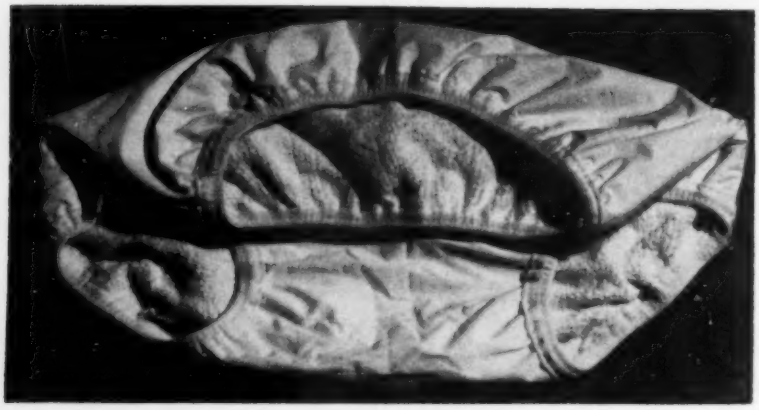
With the recent formation of Vitesta Ltd., a subsidiary specializing in reinforced glass fibre mouldings for the furniture industry, Vitafoam Ltd. can offer a complete range of prefabricated components requiring little more than assembly by overseas furniture producers. As well as glass fibre chair shells, Vitafoam exports Vitaweb, a new solid rubber webbing in prefabricated lengths with various integral fixing devices such as the metal hooks in the picture below. Other exports by the company are latex foam mattresses and pillows and rubber carpet underlay. The company has subsidiaries or distribution organization in six European countries and in Southern Rhodesia, and offers a design consultancy service for the development of exclusive designs. **Vitafoam Ltd., Don Mill, Middleton, Manchester.**





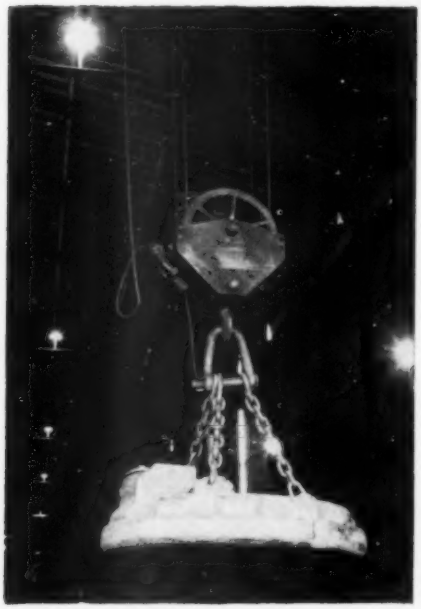
The floor of this well designed boys' secondary modern school is laid with Marleyflex floor tiles. These vinyl asbestos tiles can be laid over wood or concrete and are immune to damp and rotting. They are also resistant to oil and grease and will stand up to the hard wear which they will undoubtedly receive. The company also manufactures and exports pvc tiles and vinyl sheet floor and wall coverings, floor accessories, vinyl handrails, space-saver doors and acoustic and insulation materials. **The Marley Tile Co. Ltd., Riverhead, Sevenoaks, Kent.**

Bendy toys can be made to look as though they are in a state of suspended animation, enabling children to give the toy a personality and position it to characterize the mood of their play acting. They excite the imagination with the many poses into which they can be bent. Bendy faces are a new approach to puppetry and enable the child to enact endless expressions. **Newfeld Ltd., Newfoam Works, Spelthorne Lane, Ashford, Middlesex.**

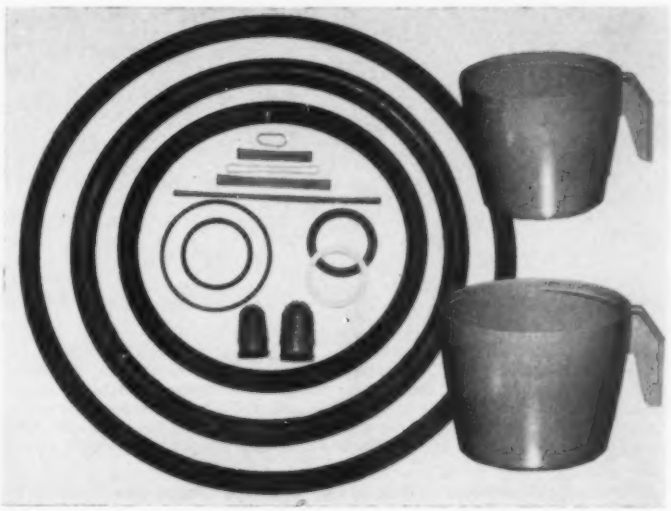


Two newly introduced lines by the company are Young Teen sanitary knickers and trainer pants. The trainer pants, illustrated here, are pvc lined with Terry towelling and the range is made up of four sizes designated by baby weight—the only practical way of sizing. The four sizes cover weights from 14-18lb. to 34-40lb. **I. B. Kleinert Rubber Co. Ltd., 91 New Bond Street, London, W.1.**

Cables clad in a new sheathing material — Niplas — made from a blend of Geon pvc and Hycar nitrile rubber have been standing up to particularly heavy duty in the scrap metal shed of John Summers and Sons Ltd. The new covering withstands temperatures of up to 85°C., has good mechanical properties and good oil, solvent, fire and abrasion resistance. The cables are manufactured by Greengate and Irwell Rubber Co. Ltd. and can be made in a variety of bright colours. **British Geon Ltd., Devonshire House, Piccadilly, London, W.1.**

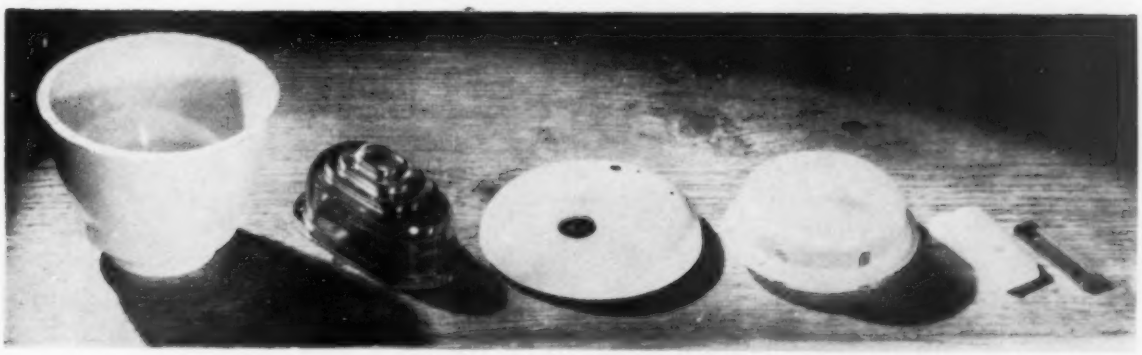


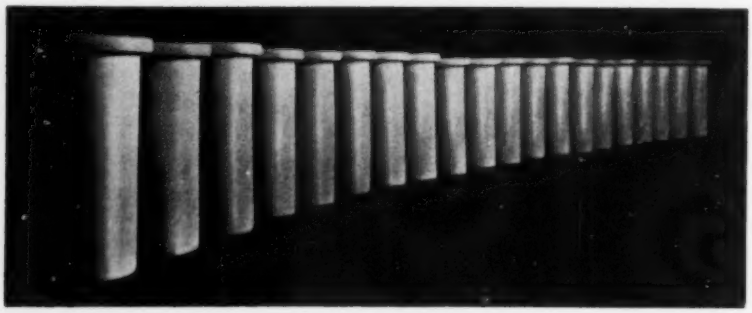
Illustrated are a few of the wide range of products manufactured by the company. Thermoplastic products include mouldings and extrusions for the refrigeration and motor industries and the medical profession. The company also produces mouldings and extrusions in solid and sponge rubber, being suppliers to many motor car and domestic appliance manufacturers. Standard components manufactured include brake blocks, basin plugs, cistern pulls, door stops and Royle's unions and wheels for domestic and industrial use are a speciality, ranging from 14in. diameter barrow wheels to 1in. castor bowls. **Capon Heaton and Co. Ltd., Hazelwell Mills, Stirchley, Birmingham, 30.**



The company manufactures general rubber goods, with particular emphasis on extruded items and products cut from extruded tube, such as varying types of food-preserving rings. The company also moulds a variety of products in both natural and synthetic rubbers, including the finger cones, pressure-cooker rings, pipe joint rings, elastic bands and rubber erasers. In addition to rubber manufacture, the company are injection moulders of plastics materials, as illustrated by the Thermos vacuum flask cups. **The Poppe Rubber and Tyre Co. Ltd., Sherland Works, Twickenham, Middx.**

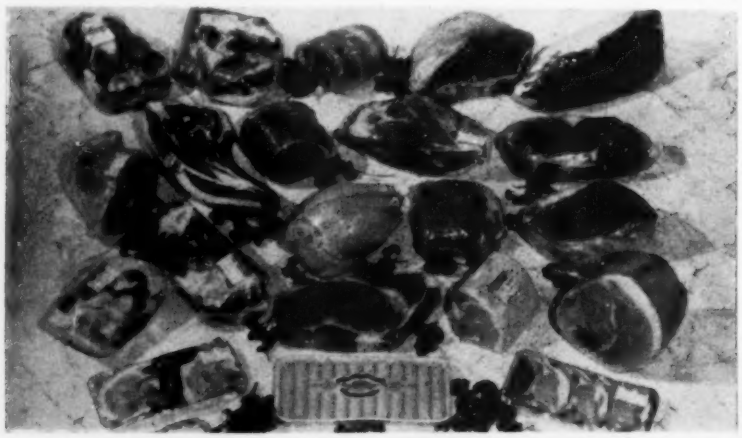
The total exports of Cressite moulded and extruded components, of which a few are illustrated, continue to expand. Pet accessories are shipped in increasing volume overseas, particularly to USA and Canada. Apart from direct exports, a large proportion of production is sold overseas as component parts of other UK manufactures. **Cressall Tyre and Rubber Co. Ltd., Cressite Works, Oyster Lane, Byfleet, Surrey.**



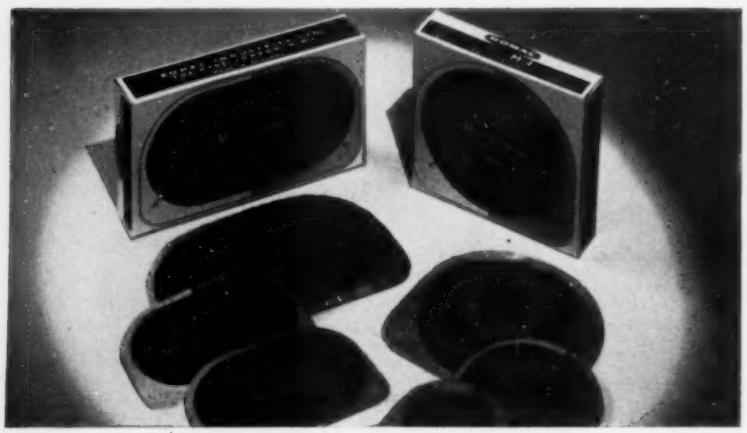


Vyon is a chemically inert and permeable high-density polythene. Its permeability is uniform and can be controlled during manufacture to suit different applications. Uses include the manufacture of silencers for pneumatic equipment, filters for active chemicals, moulded orthopaedic splints and food handling. The illustration shows a de-ionizer unit which incorporates Vyon diaphragms to give an even flow of water over the whole area of the ion-exchange resin. **Porous Plastics, Dagenham Dock, Essex.**

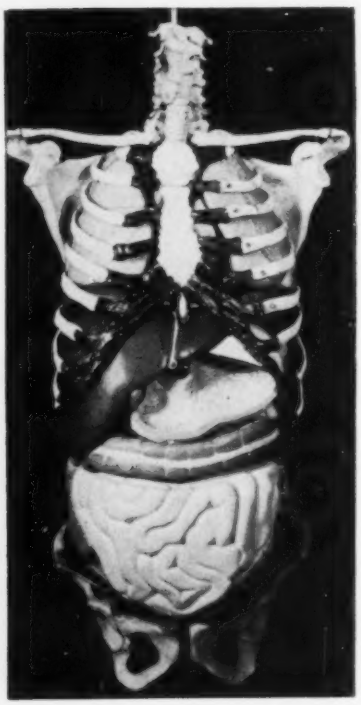
Pliofilm, produced from rubber hydrochloride, is a transparent film that displays the colour and texture of the item packaged and has the added advantage of being extremely moisture-resistant. Being a thermoplastic, non-coated material, it is ideally suited for food packaging, will hold grease and oils and when laminated with other materials provides protection, aroma and taste-retention for such things as dehydrated soup powders and ground coffee. **Goodyear Tyre and Rubber Co. Ltd., 36 Buckingham Gate, London, S.W.1.**



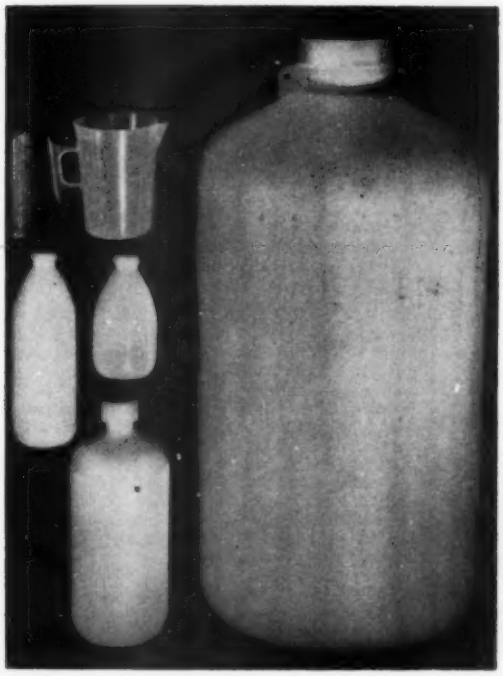
Pictured are the first of a range of Motorway patches for tube and tyre repairs on light vans, cars, motor-cycles and scooters, introduced at the Motor Show. The patches have been developed from the Romac Cure-C-Cure range, which they are intended eventually to replace. Improvements include an easier and faster method of application which results in a safer and stronger repair, and security is aided by greater efficiency of the adhesive surface, and the reinforcement of the centre of each patch with a double thickness of natural rubber. **Romac Industries Ltd., The Hyde, London, N.W.9.**



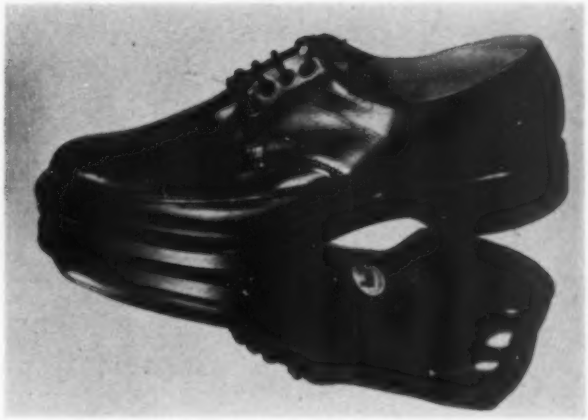
The company makes a range of anatomical models for medical and educational training purposes. The skull and other bone structures are made in acrylic material which has the feel and appearance of bone, but is more robust. Detailed anatomical markings are reproduced from the human original. Models of the internal organs are produced from latex, and anatomical features are painted in distinguishing colours. The Skeletonso — a new development — combines the internal anatomy with the skeleton. Over 50% of the company's production is exported. **Educational and Scientific Plastics Ltd., Holmethorpe, Redhill, Surrey.**



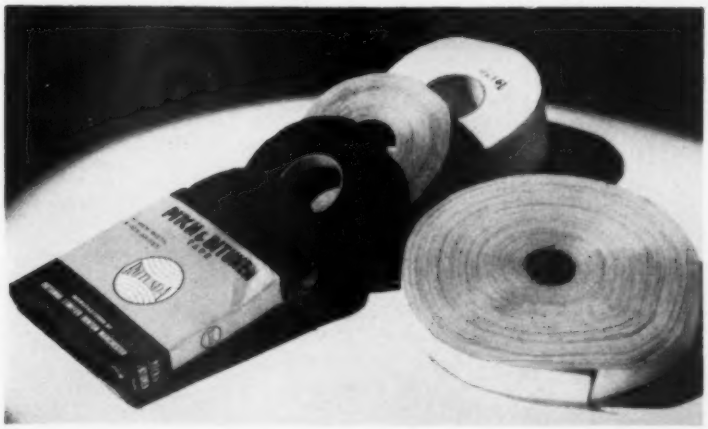
Freeflex rigid, semi-rigid and flexible containers manufactured from low- and high-density polythene are a speciality of the company. The standard range covers all sizes from 5cc. to 5gal. The illustration shows several blown bottles including a 5gal. hd polythene unit with a carrying handle. **William Freeman and Co. Ltd., Suba-Seal Works, Staincross, Barnsley.**



Collapsible containers such as the one illustrated are one of the most interesting export items made by the company. They are being used for transportation and static storage of liquids in many areas of the world, including the Sahara and Libya, the Philippines, Canada, Jamaica, Madagascar and Sierra Leone. Major users of the containers are oil and prospecting companies. Another novel application which has been found for the containers in a slightly modified form is as flotation bags to float logs down rivers in Finland. **Dunlop Rubber Co. Ltd., General Rubber Goods Division, Cambridge St., Manchester 1.**



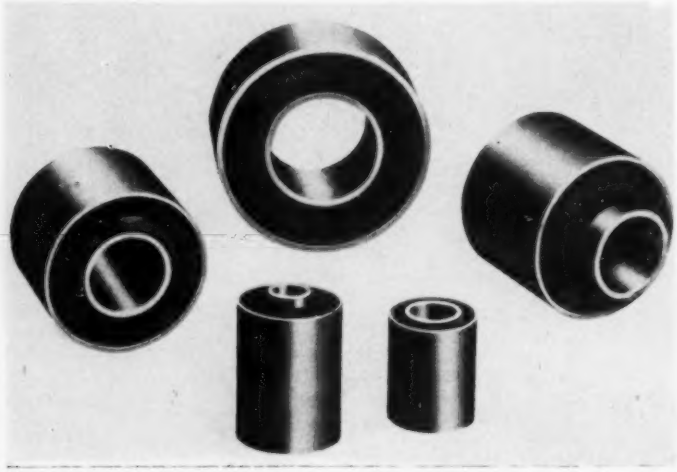
The famous Tuf lightweight shoe has direct-moulded microcellular resin rubber soles moulded from blanks supplied by Avon Footwear Soles Ltd. These blanks are made from SBR manufactured by Polymer Corporation. **Moulded Footwear Ltd., 34 St. George Street, W.1.**



Allied to the cable industry for which they manufacture a wide range of cable wrapping and sheathing materials, the range of Rotunda electrical insulating and corrosion-resistant tapes available generally to industry is growing. These include pvc adhesive tape, pure rubber splicing compound tape and silicone insulated glass cloth tape. The latest addition is a polythene-based self-amalgamating tape which is strongly elastic, and has outstanding ozone and moisture resistance. **Rotunda Ltd., Holland Street, Denton, Manchester.**

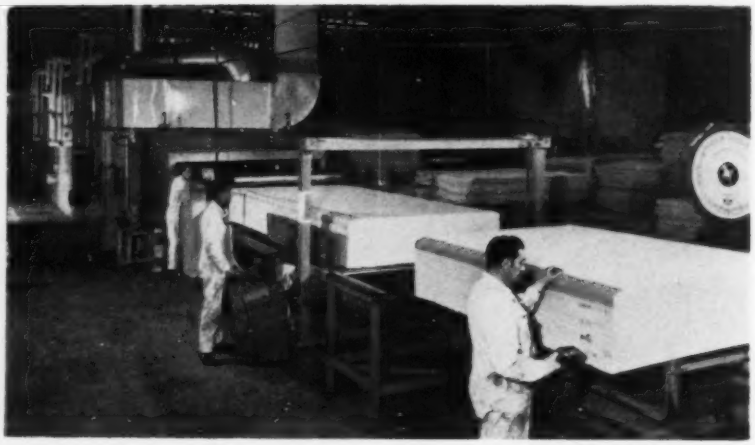
The company manufactures glass-fibre mouldings for domestic and industrial use. A specialist in lightweight bodywork for sports and racing cars, it produces detachable hardtops and replacement body panels for production cars. Pictured is an Austin Healey Sprite Mark I fitted with the Ashley GT bonnet — a moulding of half the weight of the steel panel it replaces. **Ashley Laminates Ltd., Bush Fair, Harlow, Essex.**

Metalastik Ltd. specializes in the design and manufacture of flexible bearings, anti-vibration mountings, flexible couplings and rubber suspension for road and rail vehicles. These components are ultra-duty flexible bearings. Manufactured in a wide range of sizes, ultra-duty bearings accommodate oscillating movement without lubrication or wear and facilitate lining-up. **Metalastik Ltd., Evington Road, Leicester.**



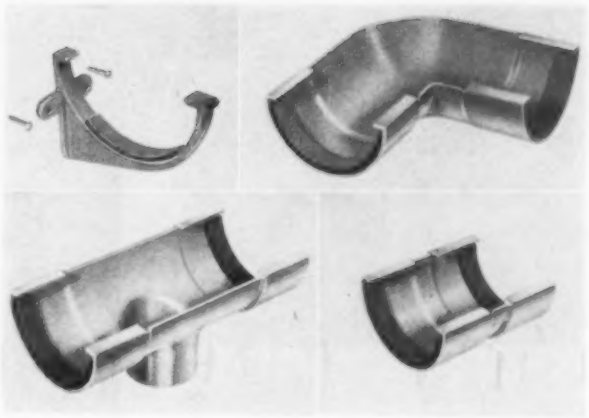
Conveyor belting, rubber hose, fluid sealing devices, fire hose, protective clothing and transmission belting are the main products of George Angus and Co. Ltd. Well known as the manufacturer of Gaco oil seals, the fluid sealing division of the company operates from a 19-acre factory—the largest of its kind in Europe—at Wallsend-on-Tyne. Conveyor belting, rubber hose and transmission belting embodying synthetic and natural rubber, pvc and synthetic fibres are produced at the Walker-on-Tyne plant. The general sales division operates the largest fire hose factory in the world at Bentham near Lancaster, where its reinforced rubber-lined hose is manufactured and from which it is shipped throughout the world. Drakeline, recognisable as a development of fire hose, is this factory's latest product. Proof against the deteriorating action of most aromatics, and armoured against abrasion with a tough plastic compound, Drakeline is said to be ideally suitable as a temporary pipeline. The gear division of the company cuts silent-running gears from nylon and Durangus, a tough resinous laminate. **George Angus & Co. Ltd., Angus House, Newcastle upon Tyne, 1.**

Among Dunlop products going overseas are latex and polyether foam. This year was a notable one for the Dunlopillo Division, since the new polyether foam plant at Hirwaun, Aberdare, Glamorgan, went on stream. Pictured is the completion of the automatic production process: the continuous loaf is being automatically cut to length, weighed and checked. Other products of the division include rubberized hair for upholstery and packaging, and rubber strapping, which is being used on an increasing scale. (During the first half of this year exports for the whole Dunlop Group reached record heights, showing an increase of 16% over the same period last year, and accounting for one-fifth of the home group's turnover.) **Dunlopillo Division, Dunlop Rubber Co. Ltd., Castleton, Rochdale, Lancs.**



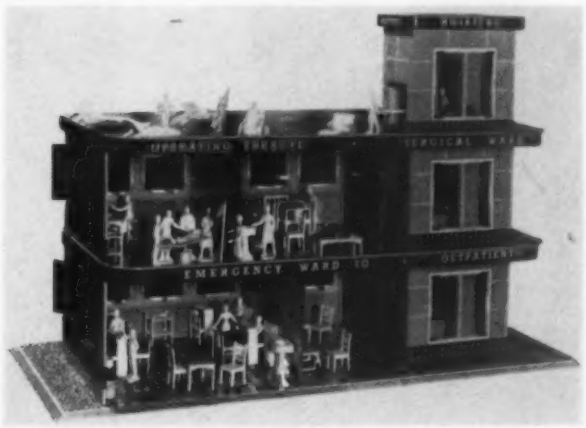
The company specializes in the manufacture of plastics balls and tip feet. The fitments shown are moulded in virgin polythene, the stock colours being black, red, white and yellow. Tip feet are made to fit up to ¼in. rod. Ball diameters ¼in. to 1¼in. to fit up to ¼in. diameter rod. **Coles Brothers Ltd., 9 Stephenson Way, Three Bridges, Crawley, Sussex.**

The Rymway system recently introduced is the result of several years' experiment and research by three companies well known in the building industry — Yorkshire Imperial Metals Ltd., Leeds, Redland Tiles Ltd., Reigate, and P. H. Muntz and Barwell Ltd., West Bromwich. Rymway is made from a tough, unplasticized pvc which is entirely corrosion resistant, light in weight, has excellent weathering properties and needs no painting or maintenance. The gutter fittings are supplied with factory-fixed all-weather jointing strips and the gutter merely snaps into position under the lugs of the fittings and fascia brackets. Permanent, water-tight joints are ensured, while allowing for expansion and contraction. Downpipe fittings are of the push-fit type and no cementing or bolting is required. Rymway is a complete system requiring no special tools to assemble and brackets and downpipe clips are supplied with fixing screws. It is quickly and economically fixed and the installation gives a clean, neat appearance. **Yorkshire Imperial Metals Ltd., P.O. Box No. 166, Leeds, Yorkshire.**

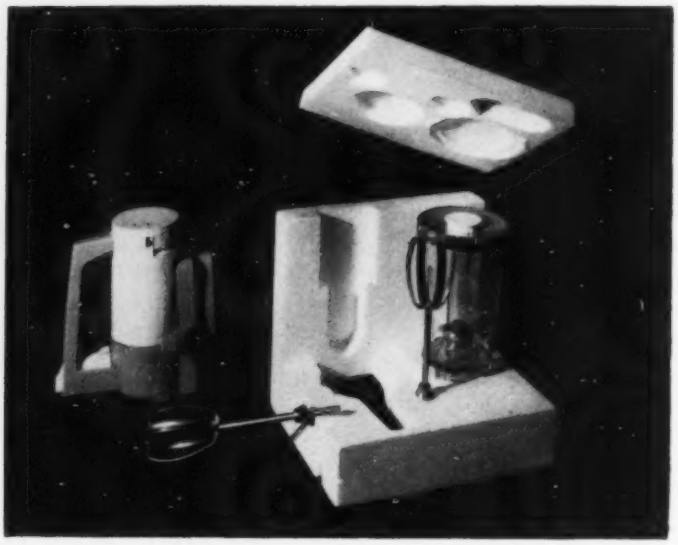


The company manufactures hose and tubing, mechanicals, domestic and sports goods. A first-class product in rubber and plastics, introduced this year, is this Gulfstream luxury shower. Retailing at £4 17s. 6d., the unit is quickly erected and fitted with three screws; it has rubber tap connexions and hose and pvc curtains. The shower has already stimulated a large number of export enquiries. **The New Croydon Rubber Co. Ltd., 36 Mitcham Lane, Streatham, London, S.W.16.**

Developments in plastics have fundamentally altered the products of the toy industry over the past few years. The Mettoy Co. Ltd. and Playcraft Toys Ltd. have played a considerable part in developing the plastics toy market, producing in pvc, polythene, polystyrene and nylon. A good example of a combination of plastics with traditional materials is shown by this assembly model of 'Emergency Ward 10'. Of metal construction, the figures and equipment are injection moulded in polystyrene, while the hospital — a final touch of realism — has windows of clear acrylic. **Playcraft Toys Ltd., Finsbury Pavement House, 120 Moorgate, London, E.C.1.**



One of the latest additions to the company's range is this Sea Esta Supersided Superb air-bed. This is made in brightly coloured material with contrasting sides for gaiety and comfort. Supplied with the air-bed is a pump, with which it can be quickly and easily inflated. The company also manufactures other inflatables — such as Sea Esta Roll-a-Boats which may be used to move the boats over the beach, as flotation bags or fenders. The chemical plant division is well known for its tank linings and another popular line is Compass dust extraction hose. **George MacLellan and Co. Ltd., Shuna Street, Maryhill, Glasgow, N.W.**

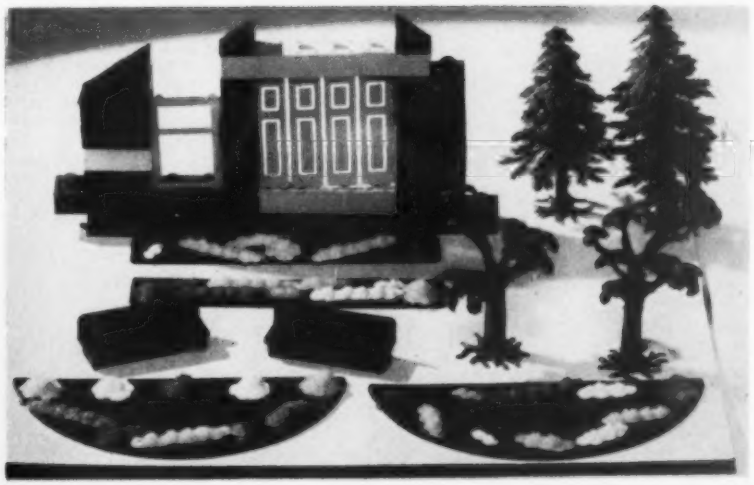


The industrial safety glove division of the company has produced a range of traditional safety gloves in natural rubber for many years. Neoprene gloves are now made in several sizes both for industrial use and in surgical thicknesses with rough or smooth finish. The Chirco ambidextrous gauntlet illustrated is used extensively in nuclear research establishments and is made to the strict specifications of the UKAEA and Euratom. The company also markets oil seals and rubber mouldings of all types. **The Chichester Rubber Co. Ltd., Roberta House, Terminus Road, Chichester, Sussex.**

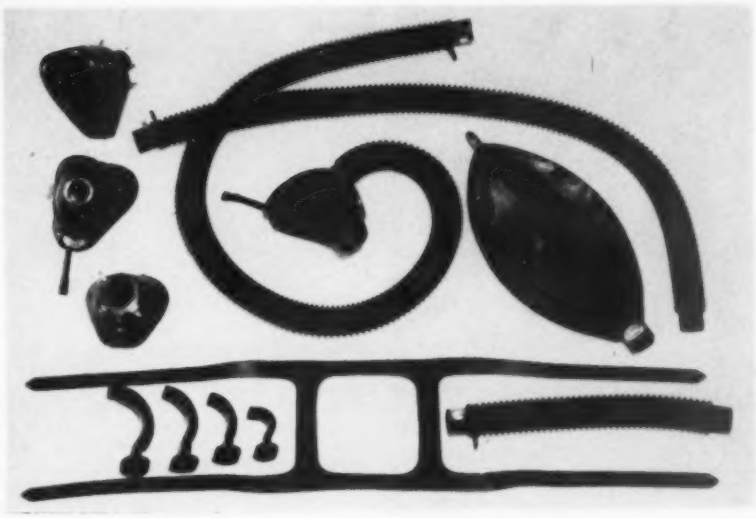
The export and transportation of delicate instruments and fragile materials has always presented a problem. The use of foamed plastics has reduced the danger of breakage to very low limits. The Kenwood Chefette dual-purpose mixer and liquidizer illustrated here is provided with an expanded polystyrene container moulded by Export Packing Service Ltd. from Montopore expandable polystyrene beads supplied by **Monsanto Chemicals Ltd., Monsanto House, 10-18 Victoria Street, London, S.W.1.**

The ceiling of the escalator at Moorgate tube station has been lined with Warerite decorative laminate. This has been selected on trial by London Transport as a new type of lining. The results of these trials have prompted further installations of this type. The good resistance of laminates of this kind to damp, corrosion, fungus growth and attack by insects, makes them suitable for use in all parts of the world. **Bakelite Ltd., 12-18 Grosvenor Gardens, London, S.W.1.**

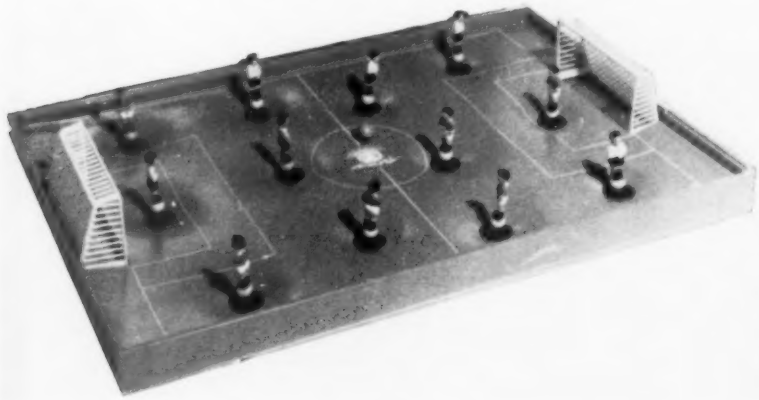
This unusual Candle pack has been produced by the company for Elizabeth Arden. Made from Utilex gold metallized and red acetate film, the pack can stand unsupported, and has been designed to catch the eye and promote impulse sales. Star motifs and lettering are screen-printed in gold on a deep-red ground. **Utilex Ltd., Mill Street, Kingston-on-Thames, Surrey.**



Minibrix is extending its well-known range of interlocking building bricks by the introduction of a wide selection of accessories. These include spare parts and colourful small models of trees, flowers, balconies, awnings, garden seats — and even TV aerials. The accessories, made in both rubber and plastics, are being sold in a variety of 22 packs. All Minibrix building sets are available in the now familiar yellow canisters, ranging from a toddler's set to a de luxe set for older children. **Minibrix Ltd., Petersfield, Hants.**



Among the surgical rubber products manufactured by the company a very important section includes a variety of components for anaesthetic apparatus, as used in operating theatres throughout the world. Today, anti-static or electrically conductive rubber is used exclusively for this purpose. The items illustrated include facemasks, head harness, re-breathing bags, corrugated tubes and airways, which are the most important rubber components used in anaesthesia. **J. G. Franklin and Sons Ltd., Birkbeck Works, Colvestone Crescent, London, E.8.**

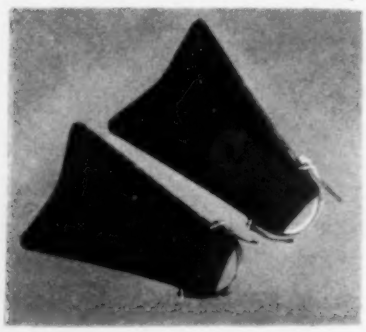


Practically every sport in the adult world is imitated in the toy world. The widening—and sensibly applied—use of plastics in this field has enabled some first-class products to be manufactured, such as this Peragame 'Football Stadium'. The field is a 19in. x 11in. polythene moulding. The footballers, who can be fitted in any position, are rubber mounted. **Chad Valley, 9 Chandos Street, London, W.1.**

The company produces a complete range of protective clothing from Vynoflex, a new and highly successful material. This consists of a Terylene net laminated between two pvc films. It is light in weight, extremely strong, resistant to most acids and alkalis and will not readily crack at low temperatures. It has been used in the manufacture of garments for all types of industries, particularly outdoor activities where it is essential that work carries on under all conditions. The range includes jackets, three-quarter-length coats, full-length coats, overtrousers, leggings and sou'wester hats. White coats have proved very successful for police wear and school crossing patrol wardens. **Greengate and Irwell Rubber Co. Ltd., Greengate Works, Manchester 3.**

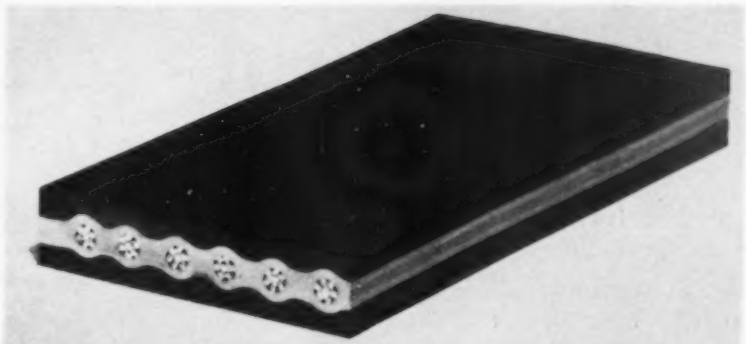
The items illustrated are representative of the wide range of mouldings and extrusions produced in both natural and synthetic materials for the automobile, aircraft, transport and other trades. The company also manufactures sponge-rubber sheeting, rods and gaskets, perambulator and industrial truck tyres as well as the world-famous Sorbo sponge-rubber balls and other sports equipment. Sorboprene foamed polyether continues to be produced on an ever-increasing scale with a wide range of uses from upholstery and sponges to soft toys. The industrial uses for Sorboprene have also been expanded during the past year. **Sorbo Ltd., Woking, Surrey.**

The company manufactures swim caps, underwater swimming equipment, hot-water bottles and rubber plugs and sockets. Many of these products are marketed in most parts of the world, distribution being particularly strong in Europe and North America. Illustrated is a floral decorated cap and a pair of Clipper swimming flippers. **W. W. Haffenden Ltd., Richborough Rubber Works, Sandwich, Kent.**

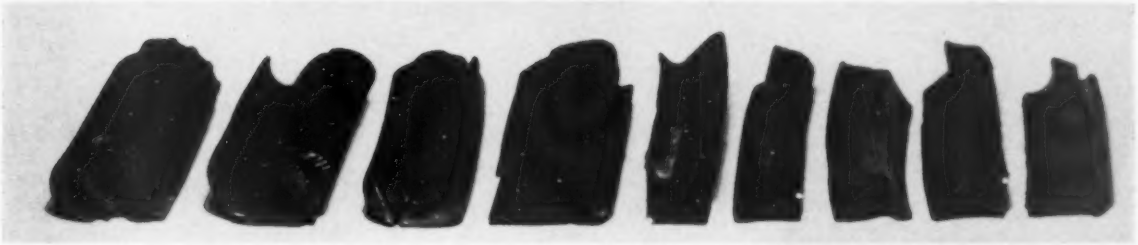


Marley vinyl wall tiles, made in two sizes of 6in. square and 4½in. square, are available in 22 patterns and colours. Marleymura wall tiles are also made in vinyl material and are tough, resilient and resistant to hard wear. These tiles are 6in. x 12in. and are made in five pleasant pastel tints, particularly effective when gauge-jointed in white as shown in the illustration. The tiles are easily cut before fixing and half-tiles, triangles, etc., can be used for added decoration. **The Marley Tile Co. Ltd., London Road, Riverhead, Sevenoaks, Kent.**

New moulded products for ladies' shoes have recently been put on the market by the company, manufacturers of Commando soles and heels. These additions to their range are contrafluted sole units and sheeting, which are available in black, fawn, brown, ivory, and dark and light translucent colours. These soles and heels give the wearer a springy, cushioned step. They are designed for use on a wide range of ladies' shoes; their non-slip pattern makes them ideal for semi-sportswear. The sheeting is available to both manufacturers and repairers to cut to any shape. **ITS Rubber Ltd., Petersfield, Hants.**



The Mitcham steel cord conveyor belt is revolutionary in construction and design as it completely dispenses with any type of fabric content. It is a rubber belt containing specially constructed steel cords for the transmission of the requisite power. These cords are placed in the warp direction of the belt only, surrounded with rubber and vulcanized into a solid mass. Highly resistant to impact, the belt is extremely flexible, possesses great tensile strength, is resistant to wear and has a maximum stretch of only 0.2%. This type of belting can carry 14,000 tons of material per hour at 1,100 feet per minute. The company specializes in the production of rubber, balata and leather transmission beltings, rubber and plastic conveyor beltings and hydraulic and mechanical leathers, and is to make the new belt under licence from its German inventors. **Barrow, Hepburn and Gale Ltd., Mitcham, Surrey.**



The company has for many years been closely associated with the motor industry and produces a large range of mouldings and extrusions for this and associated industries. A range of extruded profiles is illustrated and the company produces such items as windscreen trim, backlights, quarter lights and sponge boot lid and door seals. Rubber Bonders Ltd., an associated company, produces a variety of rubber-to-metal bonded units to specification in addition to a standard range of mountings and couplings. **Empire Rubber Co. Ltd., Dunstable, Beds.**

All the garments in the Dannimac collection, including these two attractive styles, are available for export. The light coat is in pvc and looks like leather. It has inset sleeves and is trimmed with saddle stitching. Available in beige, blue or black, the retail price in the UK is £6 19s. 6d. The other coat is a reversible model in rubberized fabric. It is washable and waterproof, has a raglan shoulder line with a Norfolk pocket, in blue or turquoise with white and retails at £5 19s. 6d. **Dannimac Ltd., 221/3 Oxford Street, London, W.1.**

The Price of Foam

COST COMPARISON OF NR/SBR LATEX FOAM BLENDS

By M. W. PHILPOTT and R. DINSDALE

Natural Rubber Producers Research Association

INCREASING quantities of synthetic rubber latex are today being used to replace natural latex in foam rubber, the manufacture of which has hitherto provided the principal outlet for natural latex. The trend from natural to synthetic has been sharpened by the introduction of improved styrene-butadiene co-polymer latices which not only yield foams of acceptable quality but, more significantly, are marketed at a stable price often below that of natural latex. The object of the present investigation was to compare the quality and cost of rubber foams derived from different blends of natural and synthetic latex.

It is generally accepted that the high solids SBR latices of large particle size offer distinct advantages over the smaller particle SBR latices which preceded them. For this reason, one of the newly-established large particle SBR latices (Intex 100) was used in the present investigation.

Two series of foams were made using two different fillers, namely, china clay and a mixture of whiting and mica 2:1. The proportion of NR to SBR latex was varied in each series to give final NR/SBR ratios of 100/0, 75/25, 50/50 and 25/75. Preliminary tests were made to establish the maximum amounts of filling ingredient that could be incorporated into each latex blend without transgressing the limits set up by the transport seating trade for (i) breaking elongation (minimum 150%), (ii) compression set (maximum 5%), and (iii) resistance to flexing (maximum loss of compression in a standard test 20%). Foams with these filler loadings were prepared from each of the four latex blends, at densities such that the foams comprising each series had approximately equal hardness or compression resistance. Thus was obtained a set of test samples representative of industrially serviceable foams having comparable cushioning capacities but differing from one another in the relative amounts of natural and synthetic rubber in their compositions.

THE AUTHORS

MAURICE WOODALL PHILPOTT, MSc, ARIC, FIRI, (right) *has spent most of his career since* 1927 *in the service of the Natural Rubber Producers. In association with the late Dr Philip Schidrowitz he became involved in development work on behalf of the 'New Uses' Committee of the Rubber Growers Association. This led in* 1934 *to his going out to Ceylon to take charge of the chemistry department of the Rubber Research Institute of Ceylon. After the war he moved to Malaya where he served for a period as head of the chemical division of the Rubber Research Institute of Malaya. In* 1951 *he finally returned to this country and is now a member of the staff of the Natural Rubber Producers' Research Association with special responsibility for latex technological research.*

After serving with the R.A.F. on an assignment connected with guided missile research and development, RAYMOND DINSDALE joined the Natural Rubber Producers' Research Association in 1959. *He is at present engaged in the experimental study of latex-foam processes.*

Materials

Latices

NR—Low ammonia (LA) type, containing zinc diethyldithiocarbamate (ZDC) as secondary preservative; used as received without deammoniation.

SBR—Intex 100.

Fillers

China clay—Devolite; added as 60% lightly ball-milled slurry.

Whiting/mica—Mixture 2 : 1 of ground whiting and mica W; added as 55% lightly ball-milled slurry.

Preparation of the Foams

The foams were made batch-wise by the silicofluoride gelling (Dunlop) process. Latex, soap and filler were whipped to near the required volume

TABLE 1

COMPOSITION AND PROPERTIES OF NR AND NR/SBR FOAMS WITH CHINA CLAY AS FILLER

	A1	A2	A3	A4
	Dry parts by weight			
NR latex concentrate	100	75	50	25
Intex 100	—	25	50	75
Potassium oleate	1.5	0.75	0.6	0.5
Zinc oxide	5	5	5	5
Accelerator ZDC	1	1	1	1
Accelerator ZMBT	1	1	1	1
Agerite white	1	1	1	1
Sulphur	2.5	2.5	2.5	2.5
China clay	32	32	32	32
Gel sensitizer EFA	1.1	0.8	0.8	0.5
Sodium silicofluoride	1.0	1.3	1.5	1.6
Volume shrinkage, %	23.2	18.0	12.4	11.8
Apparent density, g./cc.	0.122	0.125	0.127	0.131
" " lb./cu. ft.	7.61	7.80	7.92	8.16
Compression modulus, kg./cm.²	0.107	0.093	0.099	0.098
Compression loss on flexing, %	12.0	10.4	6.0	4.0
Elongation at break, %	160	155	160	155
Tensile strength, kg./cm.²	0.82	0.68	0.70	0.67
Compression set, 20°C., %	1.9	2.3	1.8	1.8
Accepted limits: Elongation at break		150% min.		
Compression set		5% max.		
Loss on flexing		20% max.		

in a Peerless mixer. Gel sensitizer was then added, followed by a dispersion containing the mixed curatives and antioxidants. Whipping was continued to the final volume, gelling agent (sodium silicofluoride) was added and the froth was poured into moulds. After vulcanization in steam at 100°C. for 20 minutes the foam was stripped from the moulds, washed in cold water and dried at 70°C. for four hours. No serious difficulty was experienced in stripping the wet cured foams from the moulds.

With two exceptions, foams vulcanized and dried under these conditions had breaking elongations which approximated to the required minimum (150%) and showed little change with moderate variation in time of vulcanization. The exceptions were foams with 50% and 75% SBR loaded with china clay (preparations A3 and A4 of Table 1). Given the standard curing treatment these foams developed elongations which were well above the specified limits (ca. 200%) but which declined rapidly with increasing time of cure.

In storage, or after brief oven ageing, such foams suffered a marked loss of elongation through continuation of cure. Hence, to raise their filler loading to the level at which, *freshly prepared*, they would just conform to the specification was inadmissible, since after a relatively short period of self cure their breaking elongations would fall below the required level.

It was considered preferable to choose filler loadings that would ensure conformity to specification by fully cured foams, that is, by foams cured to the state at which breaking elongation changed relatively slowly with time of cure. For this reason foam preparations A3 and A4 were given supplementary dry heat cures of respectively 15 and 45 minutes at 100°C. Such disparities in curing characteristics could equally well have been compensated by adjustment of the curative system, but this would have obscured the simple comparison of material costs, which was the primary object of the trials.

The experimental foams were tested for shrinkage, tensile strength and elongation, compression modulus, compression set at room temperature, and compression loss due to flexing. The test methods are described in Appendix 1.

TABLE 2
COMPOSITION AND PROPERTIES OF NR AND NR/SBR FOAMS WITH WHITING/MICA AS FILLER

	B1	*B2*	*B3*	*B4*
	Dry parts by weight			
NR latex concentrate	100	75	50	25
Intex 100	—	25	50	75
Potassium oleate	1.5	0.75	0.6	0.25
Zinc oxide	5	5	5	5
Accelerator ZDC	1	1	1	1
Accelerator ZMBT	1	1	1	1
Agerite white	1	1	1	1
Sulphur	2.5	2.5	2.5	2.5
Whiting/mica 2 : 1	34	24	24	20
Gel sensitizer EFA	1.1	0.8	0.8	0.5
Sodium silicofluoride	1.0	1.3	1.5	1.6
Volume shrinkage, %	24.4	24.4	13.7	10.9
Apparent density, g./cc.	0.129	0.137	0.137	0.142
„ „ lb./cu. ft.	8.05	8.53	8.66	8.66
Compression modulus, kg./cm.²	0.124	0.129	0.126	0.121
Compression loss on flexing, %	9.8	6.2	3.8	4.1
Elongation at break	145	155	167	140
Tensile strength	0.85	0.79	0.86	0.66
Compression set, 20°C.	3.0	3.8	1.9	1.8

Accepted limits: Elongation at break .. 150% min.
Compression set .. .. 5% max.
Loss on flexing .. .. 20% max.

TABLE 3
MATERIAL COSTS OF NR AND NR/SBR FOAMS

Filler	*China Clay*				*Whiting/mica*			
Modulus, kg./cm.²	0.100				0.125			
	A1	*A2*	*A3*	*A4*	*B1*	*B2*	*B3*	*B4*
NR/SBR	100/0	75/25	50/50	25/75	100/0	75/25	50/50	25/75
Foam density, g./cc.	0.117	0.128	0.134	0.134	0.129	0.137	0.137	0.142
NR latex price;								
Per lb. dry wt. / Per gallon (approx.)								
	Cost — pence per lb.							
30 pence / 14/-	24.0	23.4	22.8	22.0	24.2	25.0	24.5	24.0
36 „ / 17/-	28.2	26.4	24.9	23.1	28.4	28.4	26.8	25.2
42 „ / 20/-	32.4	29.8	27.0	24.2	32.6	31.8	29.0	26.4
	Cost — pence/cu. ft.							
30 „ / 14/-	175	187	192	185	195	213	210	212
36 „ / 17/-	206	212	209	194	228	242	229	223
42 „ / 20/-	237	239	227	203	262	272	248	234
	Volume cost relative to NR=100							
30 „ / 14/-	100	107	110	106	100	109	108	109
36 „ / 17/-	100	103	102	94	100	106	100	98
42 „ / 20/-	100	101	96	86	100	104	95	90

Results

Progressive substitution of NR by SBR led, as was expected, to changes in the processing behaviour of the compounds and in the quality of the products. The more important of these changes are evident in the data of Tables 1 and 2 which are summarized below.

Processing Characteristics

For a given rate of frothing the quantity of soap required was roughly proportional to the amount of NR in the blend. The addition of more than the indicated quantity of soap usually led to the formation of a loose skin on the finished product.

As NR was progressively replaced by SBR satisfactory gelling was best achieved by increasing the amount of silicofluoride and reducing that of the gel sensitizer.

Gel shrinkage diminished as the proportion of SBR was increased.

Physical Properties

Compression modulus diminished when NR was replaced by SBR; in other words, a higher density was required to maintain a constant level of hardness or compression resistance.

Other consequences of increasing the proportion of SBR in the compound were: a reduction in compression loss due to flexing; no change in compression set at room temperature; no appreciable change in tensile (and therefore tear) strength.

Costs

For a valid comparison of material costs it was necessary to know within close limits the densities at which the foam compositions to be compared would have the same resistance to compression. In the case of the whiting/mica series the experimental samples were all within 4% of their mean hardness and were judged to be sufficiently uniform to be compared directly. But the clay-filled foams were more variable, showing modulus values ranging from 7% below to 7% above the mean. A separate trial was therefore made to determine for each

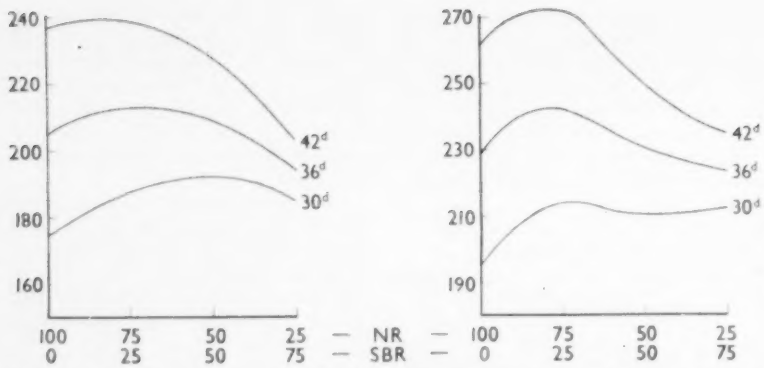


Fig. 1. Costs in pence cu.ft. of NR/SBR latex foam blends based on a cost of 27d./lb. dry weight for SBR latex and of 30d., 36d. and 42d. lb. for NR latex. *Left:* **China clay-loaded foams, modulus 0.100 Kg/cm².** *Right:* **Whiting/Mica-loaded foams, modulus 0.125 Kg/cm².**

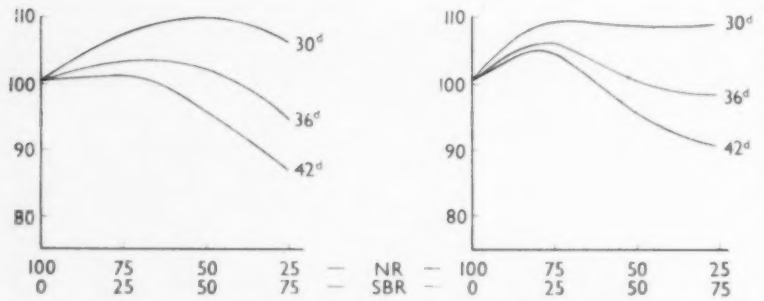


Fig. 2. Materials cost of NR/SBR latex foam blends relative to all-NR = 100. *Left:* **China clay-loaded foams.** *Right:* **Whiting/Mica loaded**

clay-filled latex blend the relationship between modulus and density (Appendix 2) and from this to estimate the foam densities corresponding to selected levels of hardness.

Material costs are set out in Table 3 for four clay-filled foams at densities corresponding to a constant modulus of 0.100kg/cm², and for four whiting/mica-filled foams of modulus 0.125±0.004kg/cm². It will be noted that the data provide no direct comparison between china clay and whiting/mica as loading ingredients because the two series of preparations were made at different levels of hardness.

The calculations are based on SBR latex selling at 27d. per lb. dry weight and NR latex at three different price levels. The assumed prices of other ingredients are shown in Appendix 3.

Although costs per lb. of foam are recorded, a more significant comparison is the cost per cubic foot of foam, or the volume cost relative to that of NR foam = 100. These volume costs are plotted in Figures 1 and 2 as a function of NR/SBR ratio.

From the results it is evident that the economic advantage of replacing NR by Intex 100 in foam is limited to the situation where not only is the price of natural rubber improbably high, but replacement is of a high order, say, over 50%. Substitutions of around 30% or less entail no cost saving, even with NR latex at the high price level of 42d. per lb. With NR at its current price of about 30d., substitution by SBR involves a cost penalty at any level of substitution. The raw materials cost of foam from a 50/50 blend may exceed by 10% that of a wholly NR foam of equal modulus. The saving due to the cheaper raw material is more than compensated by the increased density required to maintain a constant load-bearing capacity.

TABLE 4
DENSITY OF FOAMS AT THREE LEVELS OF HARDNESS
China Clay Series

Compression modulus:	0.08		0.10		0.12	
	g./cc.	*Rel. to A=100*	*g./cc.*	*Rel. to A=100*	*g./cc.*	*Rel. to A=100*
NR/SBR, 100/0 ..	0.110	100	0.117	100	0.124	100
„ 75/25 ..	0.112	101	0.128	110	0.143	115
„ 50/50 ..	0.125	113	0.134	115	0.144	116
„ 25/75 ..	0.125	113	0.134	115	0.144	116

APPENDIX 1
TESTING METHODS

Shrinkage

The volume of a moulded cylindrical test specimen expressed as a percentage of the mould volume.

Elongation at Break (EB) and Tensile Strength (TS)

Both properties are determined by pulling dumb-bells (BS 903: Part F7: 1956) to break. EB is expressed as a percentage of original length; TS in kg/cm².

Compression Modulus (M)

The load in kg/cm² required to compress an uncored cylindrical test specimen through 40% of its original height.

Compression Set (CS)

Cylindrical test specimens are compressed to 50% of their original height for 72 hours at room temperature (20° ± 5°C). Compression set is the decrease in height measured 30min. after release, expressed as a percentage of original height.

Flex Loss (FL)

The loss in compression modulus (expressed as a percentage of the original compression modulus) when a cylindrical test specimen is flexed 250,000 times at a rate of 4 cycles per second through 40% of its height.

(NOTE.—In both the modulus and flex loss tests the specimen is conditioned before test by flexing 240 times through 40% of its height).

APPENDIX 2
DENSITY-MODULUS RELATIONSHIPS OF CHINA CLAY-FILLED FOAMS MADE WITH DIFFERENT NR/SBR BLENDS

In agreement with previous observation, the compression resistances of foams having the same composition but different densities were found, to a first approximation, to be linearly related to their apparent densities. Foams containing a high proportion of SBR had compression resistances that could be represented on a hardness/density diagram by a straight line of the same slope but lying below the corresponding straight line for 100% NR. For intermediate ratios of NR to SBR, *e.g.* for blends containing 25% SBR, a somewhat different hardness/density dependence was observed, represented by a straight line of smaller slope. The regressions of compression modulus M (kg/cm²) on foam density D (g./cc.) as calculated from the experimental data, are given by:

NR/SBR, 100/0 M = 2.74D — 0.221
75/25 M = 1.28D — 0.063
50/50, 25/75 M = 2.23D — 0.199

Between the first and third of the above regression coefficients no difference is established by the data; but the middle coefficient, corresponding to foams made from 75/25 blend of NR/SBR, is significantly ($P < 0.01$) smaller than the other two coefficients. This anomalous behaviour of certain blends of natural and synthetic rubber calls for further investigation.

Table 4, derived from the above regression equations, shows the calculated densities required to give clay-loaded foams of three hardnesses corresponding to M = 0.08, 0.10 and 0.12 kg./cm².

APPENDIX 3
ASSUMED PRICES OF MATERIALS
(Pence per lb. dry weight)

NR Latex	30, 36 and 42
SBR Latex	27
Whiting	0.75
Mica W	8
China Clay	2
Accelerator ZDC ..	66
Accelerator ZMBT ..	48
Zinc Oxide	12
Sulphur	4
Agerite White	108
Gel Sensitizer EFA ..	92

UK Injection Moulding Machines

COMPARISON OF STANDARD AND PREPLASTICIZATION TYPES

By W. S. PENN, BSc

THE injection moulding machine industry in the UK has now grown to large dimensions. Not only are there in the order of 30 manufacturers producing machines but all types and most sizes are available.

There are still a number of companies who manufacture the straight plunger type machines, since in certain respects these have advantages over preplasticization types. Usually, however, this applies to companies manufacturing smaller machines and most firms produce a variety of designs. These will include one or another means of preplasticization.

The present review is intended as an overall summary of the present-day position in the British injection moulding machine industry. All methods of injection moulding are discussed in some detail and a study of the relative merits and demerits of each system is included. The sources of the various types of equipment to implement the techniques are given and a catalogue of firms with their products is included for convenience.

Outline of Industry

The British industry includes producers of small and large machines. The small machines of about ½ to 1½oz. capacity are for prototype work, laboratory work and short production runs. They are usually hand-operated and typical firms include Asmidar Plastic Moulding Machines Ltd., Churchill Instrument Co. Ltd., and Volant Bros. At the other end of the scale there are a number of firms producing 200-300oz. machines, including R. H. Windsor Ltd., Alfred Herbert Ltd., and Cravens Ltd.

Since this is a time of consideration and changeover, many moulding companies are reluctant to purchase expensive preplasticization machines to replace existing equipment. For their benefit, various companies manufacture conversion units which can be fitted to existing plunger type machines. Typical companies include BIP Engineering Co. Ltd., Bone Brothers Ltd., and Bradley and Turton (Injection) Ltd. The latter company even supplies equipment for the conversion of a compression press into an injection moulding machine.

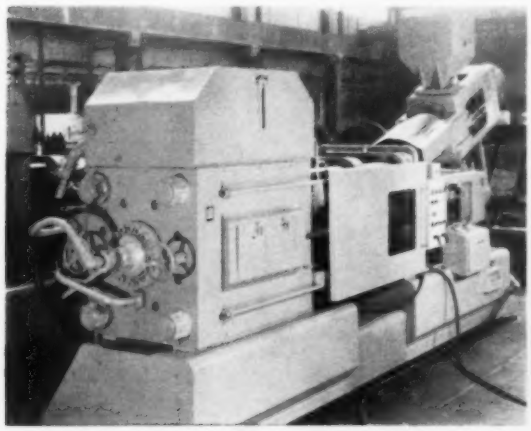
Most of the larger companies offer standard and preplasticization machines of one type or another. Many companies supply the well-known in-line type screw preplasticizers and this is perhaps the most common. Details will be found in the full list of companies given later in this article. Others supply two-stage preplasticization machines with the inclined preplasticization cylinder, utilizing either a screw or plunger mechanism. The latter type is the principle of the well-known HPM machines manufactured by Cravens Ltd.

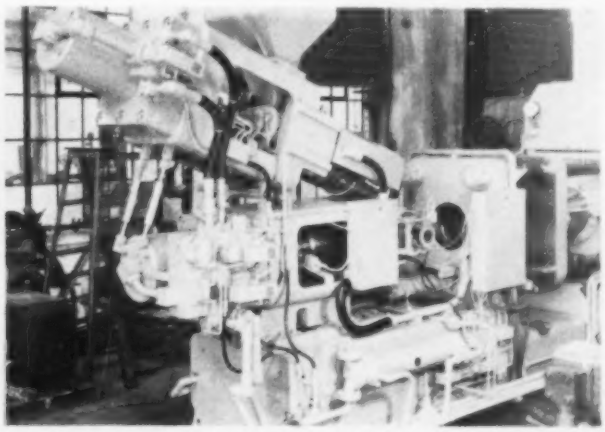
Most injection moulding machines have horizontal feed but a few employ vertical cylinders. Bradley and Turton Ltd. employs this technique with a screw type plunger and J. Brockhouse and Co. Ltd., using the Lester principle, uses a plunger type only. The vertical system, even with plunger feed, has a number of advantages including space saving, the ability to use complex inserts in the mouldings and the possibility of utilizing more easily heated spreaders inside the cylinder. This feature is included in the Brockhouse machines.

One of the difficulties of screw preplasticization is that of back flow of the melt over the flights of the screw. This is being overcome by the use of non-return valves in machines made by such firms as Foster, Yates and Thom Ltd., Alfred Herbert Ltd., Hupfield Machinery Sales Ltd. and Peco Machinery Sales Ltd.

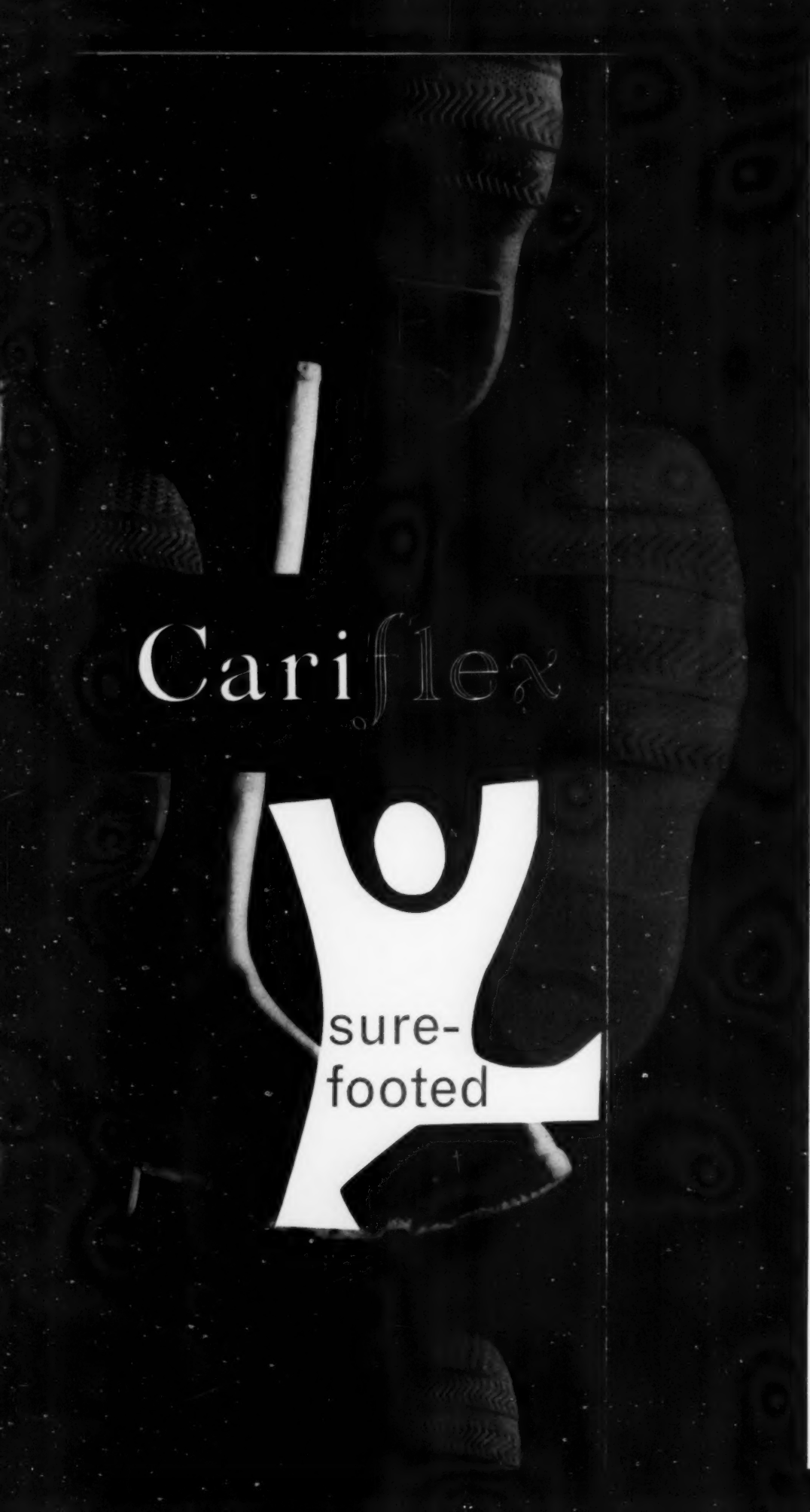
A useful innovation adopted by some companies is the use of interchangeable screws. These allow a small range of machines to be converted into a much larger range. Typical companies employing the system are the London and Scandinavian Metallurgical Co. Ltd. and Mortimer Machine Tool Co. Ltd.

This brief survey of types of injection moulding machines and components will have indicated that the British industry is alive to modern developments. There are many combinations throughout the world of the various devices now employed in injection moulding machines and all of them can be obtained in Britain.





The Craven HPM 400 P 80, 80oz. preplasticizer machine with inclined stuffer plunger. (*right*) **A view of the machine showing details of working**



'Cariflex' synthetic rubber
excellent properties of 'Ca
quality footwear.

S-1502 & S-1509

High styrene resin
SBR masterbatch.

Isoprene Rubber
I-305

All these 'Cariflex' types
make modern footwear in
From one or more of these
soles to hard resin rubber

Specify 'Cariflex

'Flotainer' Package – for
tainer, developed and used s
"cold flow", avoids distortion

Variety of Types – you may

Consistent Quality – manuf
uniform quality and consisten

Very Light Colour – enable
light colours to dark browns a

Excellent Processing – low
increased.

High Scorch Resistance – a
with minimum risk of rejects.

Good Adhesion – for uses in

Excellent Mould Flow – allo
marks.

Excellent Durability – resist

Good Ageing Qualities.

wherever you wa

rs enable footwear manufacturers to put their best foot forward – the
riflex' make them eminently suitable for the economical manufacture of

Premier types

Oil-extended type.

S-1707

SP-103

S-1009

Imparts a useful dimensional stability.

Shell's *cis*-1,4-polyisoprene has the high resilience and low heat build-up of natural rubber plus light colour, purity, *consistent quality* and excellent mould flow.

The new oil-extended Isoprene Rubber giving most of the premium properties of I-305 at lower raw material cost.

Isoprene Rubber I-500

are light coloured, non-discolouring rubbers and are widely used to
many parts of the world.
e types every variety of footwear can be made – from soft sponge slipper
soles, from heavy duty boot soles to lightweight galoshes.

' synthetic rubbers...

convenient mechanical handling and economic storage, the 'Flotainer' con-
solely by Shell, keeps bales of 'Cariflex' in their original condition, restricts
and protects from contamination.

choose the most suitable type for a specific application.

factured in Shell's modern synthetic rubber plants, 'Cariflex' SBR and IR are of
ncy.

es the whole range of footwear colours to be achieved; from translucent and
and black.

Mooney types, especially, minimise the mixing time thus enabling output to be

allows the use of fast cure times with safety – thus further increasing output rate

which building tack is important, specially designed 'Cariflex' types are available.

ows every part of intricate moulds to be filled without voids, irregularities or flow

stance to abrasion and flex cracking.

ant to put your best foot forward

Shell Chemicals

Translucent & Transparent Shoe Soling

	Transparent Parts (wt)	*Translucent* Parts (wt)	*Translucent* Parts (wt)
Cariflex' S-1707	100.0	100.0	100.0
Active zinc oxide	1.0	1.0	1.0
Stearic acid	1.0	1.0	1.0
Non-discolouring antioxidant	1.0	1.0	1.0
Diethylene glycol	3.0	5.0	5.0
Hexamethylene tetramine	1.0	1.0	1.0
Hydrated silica	75.0	45.0	45.0
Hydrated calcium silicate	—	—	35.0
Aluminium silicate	—	35.0	—
MBTS	1.2	1.2	1.2
TMTD	0.7	0.7	0.7
Sulphur	1.5	1.5	1.5
	185.4	192.4	192.4
Cure, minutes at 150° C (302° F)	10	10	10
Tensile, kg/cm²	177	135	135
Tensile, psi	2520	1920	1920
Modulus 300%, kg/cm²	41	58	52
Modulus 300%, psi	584	825	740
Elongation, %	750	560	545
Mooney Scorch (MS + 5 at 125° C), minutes	8	15	25
Hardness, Shore A	89	79	79

Shell's technical service

Shell have evolved a large number of formulations in Europe and America, suitable for a variety of footwear applications, to meet most manufacturing conditions. Shell's experience in all types of footwear manufacture is at your service.

Cariflex TRADE MARK

SHELL-MADE RUBBER

For further information consult your Shell Company (in the U.K., apply to Shell Chemical Company Limited, Plastics & Rubbers Division, 170, Piccadilly, London, W.1.)

Boot & C

'Cariflex' I-305	
Pepton 65[1]	
Stearic acid	
Zinc oxide	
Non-discolouring anti	
Zeolex 23[2]	
Whiting	
Shell P.E.G. 6000	
Antisunchecking wax	
ZMBT	
TMTM	
Sulphur	
Cure in air vulcaniser	
Properties – Press cu minutes at 145° C	
Tensile strength, kg/c	
Tensile strength, psi	
Modulus 300%, kg/cm	
Modulus 300%, psi	
Elongation, %	

[1] Peptiser – American Co. (UK)

[2] Hydrated sodium s Sifrance (France)

This formulation was tensile strength be un replaced by aluminiu

For processing recom literature.

Shell Chemicals

Overshoe Upper

	Parts (wt.)
	100.00
	0.25
	1.00
	5.00
ioxidant	1.00
	40.00
	30.00
	1.00
	1.00
	0.60
	0.20
	2.00
	182.05

r: 25 minute rise plus

30 minutes at 135 C (275 F)

ured,

(293 F)	15
cm^2	98.5
	1400
n^2	63
	900
	650

n Cyanamid Co. (USA) and Anchor Chemical

silico aluminate – J. M. Huber Corp. (USA) and

)

s designed for ease of calendering – should the nacceptably low it is suggested Zeolex 23 should be m silicate or Mistron Vapor.

mmendations ask your Shell Company for technical

Resin Rubber Shoe Soling

(To meet SATRA Specifications).

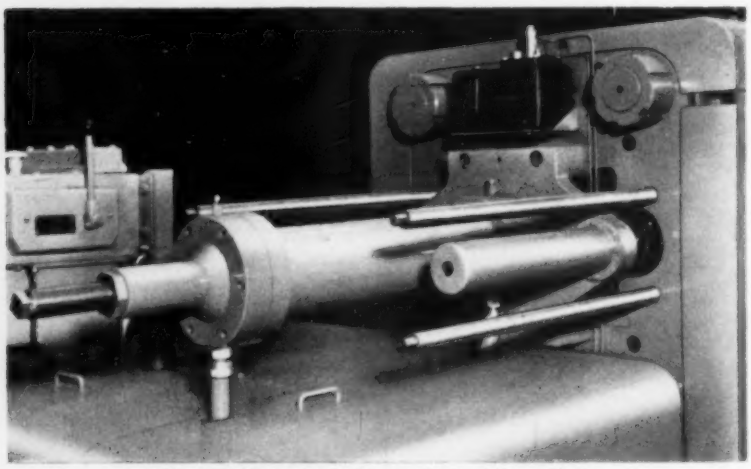
SATRA Grade	*1XF*	*2XF*	*2XF*
'Cariflex' S-1509	75.00	75.00	—
'Cariflex' S-1707	—	—	75.00
'Cariflex' SP-103	50.00	50.00	50.00
Zinc oxide	3.00	3.00	3.00
Stearic acid	2.00	2.00	2.00
Non-discolouring antioxidant	0.50	0.50	0.50
Aluminium silicate	80.00	80.00	80.00
Diethylene glycol	2.25	2.25	2.25
Precipitated whiting	25.00	—	—
Coumarone resin (m.p. 100 C)	4.00	6.00	6.00
China clay	—	125.00	125.00
'Dutrex' 61	2.00	2.00	2.00
Shell micro-wax	2.50	2.50	2.50
Pigments	3.40	6.00	4.30
MBT	1.00	1.00	1.00
MBTS	0.50	0.50	0.50
DPG	0.75	0.75	0.75
Sulphur	3.25	3.25	3.25
TOTAL	255.15	359.75	358.05
Cure, minutes at 150 C (302 F)	8	10	7.5
Tensile strength, kg/cm^2	105	102	90
Tensile strength, psi	1490	1450	1280
Elongation, %	470	410	350
Moorey Scorch (MS + 5 at 125 C), mins.	5	7	9
B.S. Hardness	93	95	94
Compression Set, (B.S., Const. load), %	10.9	17.3	20.2
Specific gravity	1.28	1.50	1.49

Cariflex SHELL-MADE RUBBER

Further details are given under individual companies later in this review.

Moulding with Normal Machines

The basic features of a normal injection moulding machine are fairly common to most types of equipment. Compound, in chip or powder form, is fed into a hopper which may or may not be heated to give a certain degree of preplasticization. From the hopper the material enters the heated cylinder and is pushed forward by a ram or plunger. In its passage along the cylinder the increasingly plasticized material passes round a spreader or torpedo and is injected through the nozzle.



The Peco Rotothrust hydraulic locking cylinder

The second half of the process is when the plasticized pvc passes from the nozzle, along the runners in the mould, through the gate, and into the mould cavity. The latter is quite cool (round about 30°C.–35°C.) and the two halves of the mould are held together by the pressure of a toggle mechanism. At the end of the cycle (30-45secs.) the mould is opened and the finished article is ejected. Finally, the runner has to be removed.

The injection machines may be operated by hand, be semi-automatic or completely automatic. In the first case the operator has to control all operations and this is usually confined to small machines. In the second case much is automatic but the operator often has to open the mould while in the latter case it is only necessary to feed in raw materials and collect articles from the delivery chute.

As will be seen, one of the principal objections to the use of a standard machine is that the material in the centre of the cylinder is heated much more slowly than that in contact with the cylinder walls due to poor heat transference. The use of spreaders or torpedos has helped in this direction but since they were usually unheated, the improvement was only limited. However, there have been recent developments[1] in the use of spreader heating, particularly by the use of induction heating. Spreader design, utilizing very great surface areas by the use of fins, etc., is also important. Companies which can be consulted about suitable equipment include BIP Engineering Ltd., Peco, and J. Brockhouse and Co. Ltd. (Lester).

If such techniques as this are employed, conventional machines can still be used with certain additions and these are considered later.

Injection Moulding of pvc

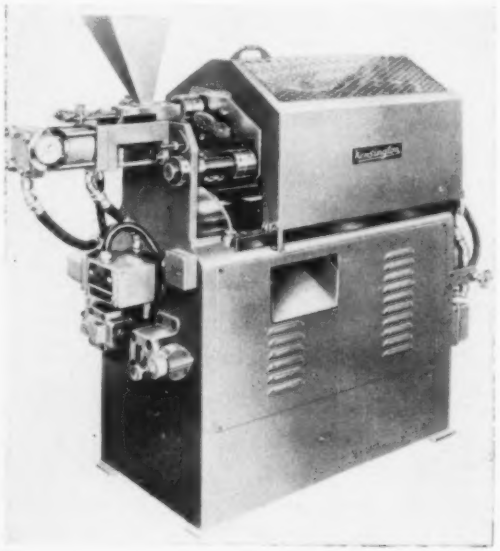
Certain thermoplastics are comparatively easy to injection mould since the temperature of operation is far removed from the temperature of decomposition. In the case of pvc, however, the two are close, so that compound design and temperature control become vital. This is particularly so with rigid pvc.

For best results the cylinder should have more than one heater band independently controlled. Then there are opposing requirements. The pvc in the cylinder should be kept as cool as possible, yet for high gloss finish the material must enter the mould as hot as possible. A successful compromise between these two requirements is one of the major tasks of an injection moulding engineer and there are various devices which he can use, described later.

The maximum temperature usually employed at the nozzle (front) end of the cylinder is 160°C. but perhaps 150°C. is a more common figure. At the rear end of the cylinder it is usual to have the cylinder about 10°C. lower than the front. It is necessary to work at as low a cylinder temperature as possible, consistent with a satisfactory finish and filling the mould. To achieve this it should be remembered that the material leaving the nozzle is probably 10°C. to 20°C. higher than the recorded temperature. In this, the same sort of principle applies as with extrusion and this becomes even more apparent with stocks preplasticized with screws.

There are two principal techniques which enable the compound to enter the mould at a higher temperature than it reaches in the barrel. The original technique was to use a restricted gate and the second one is to use a restrictor plate.

If the gate is restricted, the rapid flow of the material through it causes



Dowding and Doll's Kensington 20gm. automatic machine

the development of frictional heat which gives a good finish. If the gate is made too small it can cause the development of so much heat that burning will result. The restricted gate is also called a pin-point gate and is normally only applied to mouldings with sections up to $\frac{1}{4}$in. Above this thickness conventional size gates are necessary to avoid cavities and sink marks which means that higher cylinder temperatures will be necessary.

Using restricted gates it is possible to use lower cylinder temperatures than usual. It is also possible to adopt faster moulding cycles; the size of the gate marks on the moulding is reduced and the incidence of sink marks, associated with slow setting when large gates are employed, is reduced.

The subject of gate size has been discussed in some detail.[2] However, the size of the gate normally has to be determined by experiment, starting with a small one and gradually opening up until the correct conditions are obtained. A better method of achieving the same result is to use a restrictor plate, a novel device developed by Bakelite Ltd.[3]

The method is basically very simple and consists in interposing a plate drilled with an orifice, between the injection cylinder nozzle and the sprue bushing of the stationary mould half. A series of plates can be prepared beforehand with different diameters varying from, say, $\frac{1}{16}$in. up to near the diameter of the nozzle in $\frac{1}{16}$in. or $\frac{1}{32}$in. stages. Any of these restrictor plates can easily be fitted to the machine and the gate and the nozzle need not be modified at all. It is only necessary to carry out a series of trials using different size restrictor plates before the correct moulding conditions are established.

The drilled hole through the plate is best countersunk on the nozzle side. This allows better flow characteristics with the elimination of dangerous dead spots. The land should be kept as short as possible and the plate is fitted into a recess in the sprue bushing..

Mould and Runner Design

Compounds of pvc attack unprotected iron and steel surfaces. It is, therefore, essential that they are all protected in some way, usually by chromium plating. The mould, cylinder, spreader and nozzle all need to be protected in this way. All of the parts which the pvc flows through must, of course, be streamlined and manufacturers are now making great efforts in this direction.

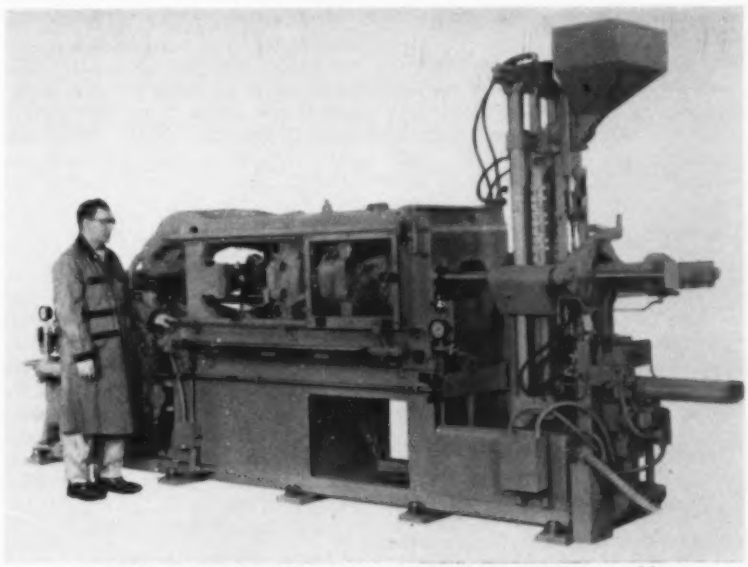
To obtain best results it is necessary to fill the mould as quickly as possible. To achieve this the route from the nozzle to the gate is kept as short as possible. The sprue and runners should therefore be very short and the runners round and parallel with circular gates. In this connexion the gates need not always be the same size (in a multi-cavity mould) since it may be necessary to balance the mould to avoid unfills. The latter can be caused by too small gates. Air vents[2] are also important and necessary and should be located opposite the gate.

An interesting method of reducing moulding cycles has been developing over the past few years. This is the use of hot runner moulds[4] which will undoubtedly be employed more in the future. They may be employed with valved gating.[5,6] Their use is restricted to some extent by the extra cost of moulds and generally speaking is confined to smaller machines. However, there is no theoretical reason why they should not be employed on larger machines and this is being tried.

In effect, the method is simple and really means that the runners become part of the heating cylinder. This is accomplished by the provision of insulated heater rings as close as possible to the runners, which thus become 'hot'. The melt is thus kept hot and produces a sprueless moulding so that only deflashing is necessary.

An interesting method of utilizing the principle of hot runner moulds without heater bands may be noted. The technique takes advantage of the low thermal conductivity of thermoplastics. The method is simple and consists in making the runners much larger in diameter than usual. This means that the first time the melt flows through the runners, some will freeze on the walls and thus insulate the remainder. Eventually, the frozen material deteriorates and needs to be removed. For this purpose the mould is so designed that the runners can easily be opened up.

Mould design for pvc compounds is relatively simple, particularly with the softer varieties of material. Some undercuts can be allowed and the use of ejector pins is often unnecessary. Even with harder materials some undercutting is permissible. However, shrinkage should be watched. With a hard compound (BS Softness 10-4) the mould shrinkage may well be of the order of 0.1% but with very soft compounds it can be as much as 1.5%, similar, in fact, to many rubber compositions. In this connexion the size of the gate as well as the moulding temperatures used can influence the shrinkage greatly.



The L-225 6 9oz. Brockhouse Lester injection moulding machine

Preplasticization Methods

The older injection moulding machines simply had a feed hopper and a ram assisted feed through the nozzle. The heating difficulties of this well-tried technique have been described so that for many years efforts were directed towards developing new methods.

Two principal methods have been devised for the preplasticization of moulding powders. The first is the 'plunger' method where the material is transferred by a plunger from the plasticizing cylinder (at an angle of about 30° to the main horizontal cylinder) into the cylinder containing the feed ram. The latter then moves forward and makes a shot in the usual way. Everything is, of course,

operated automatically and precautions have to be taken, for example, to preclude further transfer (than that required for the shot) of material from the preplasticizing cylinder while the shot ram is moving forward.

This method of preplasticization certainly speeds up the operation but it suffers from some of the same limitations as any ram machine. The screw preplasticization technique overcomes many of these objections[7] and details will be discussed later. The principle involved, however, is to preplasticize the material in the cylinder not only by external heating but by heat developed by friction as the material moves through the screw exactly as in an extruder. This is a much more precise method of controlling heat input. When the material leaves the screw and enters the transfer section it is ejected either by the screw itself moving forward as a ram or by a separate ram inside the screw.

Comparison Between Ram and Screw Machines

It is only proposed to make a relatively brief comparison of the two methods of melt feed. Those still using the ram or plunger method naturally claim advantages for their system.[6] But far more has been said about the alleged advantages of screw preplasticization.[9]

In spite of the contending arguments there is little doubt that the melt characteristics of the screw type are superior to those of the plunger type preplasticization.[9] This does not mean, however, that the plunger type does not have certain advantages as well as disadvantages over the screw type — it certainly has.

However, the flow of the melt in the ram machine is uneven. Only the front plane of the moving mass undergoes active movement, the remainder being relatively passive and laminar by nature. The usual methods of breaking up flow to give a useful dispersion of particles, such as torpedo or breaker plate, are only partially successful. They only give an improvement at the moment of disturbance and the melt returns to the old type of flow once past the barrier.

These characteristics of the ram machine have a serious bearing on the thermal characteristics. Heat is virtually applied only from the outside since there is no rotational movement of the material from outside to inside. Since plastic pvc is a poor conductor of heat, the process of heat transfer is slow, wasteful and responsible for many of the thermal troubles associated with ram injection machines.

The processes involved with the screw mechanism is quite different. As in the conventional extruder, there is movement in two main directions not counting the considerable turbulence. This means that sooner or later all particles are brought into contact with the primary source of heat. More important, however, is the frictional or adiabatic heating. This is caused by the conversion of the work performed in plasticizing the material into heat actually inside the material. It means that lower cylinder temperatures can be used and a much more thermally and rheologically homogeneous melt is obtained.

After this discussion of theoretical considerations, it is useful to see what the practical implications are. The technique is particularly useful in the case of pvc and a satisfactory melt is obtained quickly. This means that relatively low injection pressures can be used, high speeds are possible and long and thin walled products can be easily made. Although the latter can be accomplished with ram machines, the melt properties are such that very high pressures are necessary and thermal instability is always a distinct possibility.

There are a number of other important advantages. The use of the screw gives a much greater plasticizing capacity, the difference between the two methods becoming greater the larger the shot. This is illustrated in Table 1.

TABLE 1
RELATIVE PLASTICISING CAPACITY OF SCREW AND RAM MACHINES

Ram Type		Screw Type	
Plasticising Capacity lb. hr.	Shot Volume cub. in.	Plasticising Capacity lb. hr.	Shot Volume cub. in.
20	4	28	4
40	10	60	10
60	20	90	20
70	40	130	40

It will be seen from Table 1 that with the larger machines the plasticizing capacity is almost doubled. Looking at it another way, a machine with a cylinder of given size will give two and often more times the size shot with a screw than a ram type of machine.

Since the material is so much more homogeneously heated with a screw machine, the rheological properties of the melt are far more consistent.[3] This means that the finished product contains far less stresses and although such a feature is more important with polystyrene than with pvc, it is a useful attribute. The process, and similar rheological considerations, assumes much greater importance in rigid pvc than it does in the flexible variety.

All the features described probably account for the fact that the screw machines are making rapid headway against the ram type. The ram type is still by far the most common, of course, but the screw machine is rapidly catching up, particularly on the Continent and in the UK.

At the present time there is a wide difference between the USA and Europe. While Europe and the UK are accepting the screw type machine, the USA adheres persistently to the plunger type. It is interesting to examine the reason for this apparent anomaly.

The single ram (or plunger as it is often called) and the screw type machines are referred to as single-stage machines. The machine which is common in the USA with a second preplasticizing plunger is known as the two-stage machine.

Now, in spite of the apparent advantages of the screw type, the US industry achieves higher rates and outputs than the UK. The principal reason for this appears to be that US machines run at maximum pressure which develops much heat which in turn is overcome by the use of refrigerated cooling for tools. Another point is that hydraulic locking (rather than mechanical) is much more common and quicker, a circumstance no doubt dictated by cheap oil supplies.

The picture is not as simple as this because of the two-stage preplasticization type using plunger type preplasticizers represented by the HPM machines. This has certain advantages over the screw preplasticization type, particularly with the accuracy of the shot volume which in turn leads to other advantages. One of these is the consistent shot weight which usually saves material and another is the reduction in the number of sinks. Again, all types of preplasticization machines have certain disadvantages over conventional types, including greater initial cost, higher maintenance costs and longer changeover times. A full account of the differences has been given by Kriner.[5]

It would be dangerous at this very early stage in injection moulding machine development to forecast which of the techniques will eventually be favoured. There is no doubt that for many purposes the conventional plunger type will be retained but the percentage of the

type used will undoubtedly grow less year by year. Europe has already made up its mind to adopt screw preplasticization, and perhaps in due course the USA will do the same. With suitable modifications it will be possible for them to retain the advantages of their present system with the additional advantages of the screw preplasticization types. Another important point is that the only really satisfactory machine on which to process rigid pvc is the screw preplasticization type. The growing importance of this valuable material will undoubtedly help influence the final decision.

Outline of British Injection Machine Manufacturers

Introduction

It is not so very long ago that there were only about six manufacturers of injection moulding machines in the UK. The industry has developed very much over the past few years, however, and there are now about 30 manufacturing companies. All types and sizes of machines are therefore available from Britain.

The British industry may be divided into two parts. There are those manufacturers who have British origins and there are those who act as agents for companies on the Continent and in the USA in particular. Many companies are manufacturing machines under licence from abroad but by now many of them have stamped their own brand of workmanship and design into the machines so that they can be said to be British by adoption.

It is not proposed to make any distinction in the accounts of individual manufacturers which appear at the end of this article. A list of manufacturers is given in Table 2. Where appropriate, some indication has been given of the firms abroad with which the British companies are associated.

It should be stressed that only a general review of the various companies described at the end of this article has been made and that no comparison between any products is made or implied. It is not possible to give full accounts of all the companies so that for full details, reference should be made direct to the preferred manufacturer.

Table 2
Injection Moulding Machine Manufacturers

Asmidar Plastic Moulding Machines Ltd.
Baker Perkins Granbull Ltd. (Triulzi)
Battenfeld (England) Ltd.
B.I.P. Engineering Co. Ltd.
Bone Brothers Ltd.
Bradley and Turton (Injection) Ltd.
Ed. Brand Ltd. (Eckert and Ziegler)
J. Brockhouse and Co. Ltd. (Lester)
Buhler Brothers (England) Ltd.
Churchill Instrument Co. Ltd.
Cravens Ltd. (HPM machines)
Dimon (England) Ltd. (Fimsai)
Dowding and Doll Ltd.
Elgar Machine Tool Co. Ltd. (Flesch)
Engis Ltd. (Hehland Sohn)
Foster, Yates and Thom Ltd.
Grilon and Plastic Machinery Ltd. (Netstal)
Hamilton Machinery Sales Ltd. (Ankerwerk & Krauss—Maffei)
Alfred Herbert Ltd.
Hupfield Machinery Sales Ltd.
Industrial Plastics Ltd.
Denis Leader Ltd. (Esaco)
London and Scandinavian Metallurgical Co. Ltd. (Sommer)
Mortimer Machine Tools Ltd. (Stübbe)
Negri Bossi (England) Ltd.
Pearson Panke Ltd. (Hahn and Kolb)
The Projectile and Engineering Co. Ltd. (Peco)
S. R. Seymour Ltd.
Francis Shaw and Co. Ltd.
The Small Power Machine Co. Ltd.
F. J. Stokes Ltd. (F. J. Stokes Corp. USA)
Turner Machinery Ltd.
Volant Brothers
R. H. Windsor Ltd.

Examples of Machines

Some of the above principles may be more easily understood and appreciated from actual examples. Two of these are given below to demonstrate the in-line screw preplasticizer and the two-stage inclined plunger preplasticizer.

The Projectile and Engineering Co. Ltd.

This company manufactures a range of injection machines including a number of single screw preplasticizing types known as models 21 MR, 30 MR, and 40 MR, etc., with capacities from 2½oz. to 178oz. A detailed specification of a typical machine is given in Table 3.

The machines incorporate a special screw rotating and reciprocating mechanism called the Peco Rotothrust drive unit, the subject of a patent. A long L/D radio is employed, namely 17 : 1, and this assists in enabling a wide range of materials to be moulded in the same machine, without change of head or screw. However, the shot size can be varied (A, B and C in the specification) by the use of different diameter screws.

The locking unit is the well-known horizontal Peco toggle type which is activated hydraulically. It incorporates a device which enables the mould to be slowed down towards the end of the opening stroke. This helps the ejection process. In this connexion, full ejection facilities are provided.

In the case of the injection unit, it is mounted on steel ways and is retracted by means of a hydraulic cylinder which breaks the sprue. The break can be fixed automatically since the length of travel can be determined by a limit switch.

The design of the screw is important and is of the increasing core diameter type made of a high quality alloy steel. It incorporates a non-return valve and this, together with the general shape, ensures that only the material for the next shot is injected and that no material leaks past the head thus causing sink marks. The barrel is divided into three zones for temperature control purposes.

A feature of this barrel is a vented hopper base plate which permits volatiles to escape from the end of the screw.

The size of shot may be infinitely controlled. Water cooling is provided and a means of determining the rate of flow is given, in much the same way as extruders — a most important feature. The fully automatic cycle starting from the screw retracted position, mould open and the requisite volume of material in the metering position is as follows:

(1) The mould closes.
(2) If the sprue break technique is used, the carriage moves forward, opening the shut-off nozzle (if used).
(3) The shot is injected.
(4) The screw remains in the forward position until the end of the dwell time.
(5) The cooling starts and the screw retracts, simultaneously revolving and moving material forward until the correct volume has been metered, when it automatically stops.
(6) At the end of the cooling cycle,

Table 3
The Peco 40 MR Injection Press Specification

	Type A	Type B	Type C
Weight moulded per shot of polystyrene, oz.	18	24	30
Approximate plasticizing capacity, lb. hr.	200	200	200
Range of screw, rpm	15-90	15-90	15-90
Diameter of screw, in.	3½	4	4½
Maximum injection pressure, psi	15,000	11,600	9,100
Full injection stroke, in.	3½	3½	3½
Rate of injection, cu. in. sec.	20	26.7	33
Projected moulding area, sq. in.	130	174	210
Space between tie bars	19in × 21in		
Mould opening stroke adj.	12½in—17½in		
Mould locking force	300 tons		
Capacity of heaters	18kW.		

the carriage moves back, breaks the sprue, the moulding is ejected and removed.

Cravens Ltd.

Cravens manufactures a range of HPM machines of which model 650-P-80, the 80oz. shot machine is a first-class engineering unit. The machine consists essentially of an injection plunger for making the shot and an inclined stuffer plunger, both actuated by one double acting ram. Some details of the machine are given in Table 4.

TABLE 4
DETAILS OF CRAVENS HPM INJECTION MACHINE MODEL 650-P-80

Volume moulded, per shot	141 cub. in.
Weight moulded, per shot	80oz.
Plasticizing capacity	200lb./hr.
Injection plunger	3⅛in diam.
Injection plunger area	11.79 sq. in.
Pressure on material	20,000psi
Stroke of injection plunger	12in.
Rate of injection	51 cu. in./sec.
Size of die platen	48in. × 48in.
Space between bars	30½in. × 30½in.
Mould opening stroke	30in.
Maximum daylight	58in. 50in. with ejector box 42in. with ejector box and spacer
Minimum die space	28in. 20in. with ejector box 12in. with ejector box and spacer
Mould locking force	650 US tons 580 long tons
Capacity of hopper	200lb.
Power consumption of heating units when plasticizing to full capacity	49kW.

The stuffer plunger has the same details as the injection plunger. Some specialized features of the machine are as follows:—

(a) The mould clamp is actuated hydraulically by means of a double acting ram and on the return stroke the clamp is adjustable to any position, permitting the shortest possible movement.
(b) All internal surfaces of the heating chamber are chromium plated.
(c) A single rotary valve provides positive nozzle shut-off during stuffing. The valve shifts for injection and opens a passage from the injection chamber to the nozzle and closes the passage from the preplasticizer.
(d) Manual as well as automatic control is possible.
(e) Adequate safety precautions are taken during the clamp closing.

The operation of this machine may best be seen from the sequence of operations starting with the elapsed time of the injection timer.

(a) The rotary material control valve blocks the nozzle and opens the passage between preplasticizer cylinder and injection chamber. The injection plunger is in the forward position.
(b) The stuffing plunger reciprocates and pumps melt through the rotary valve into the injection chamber.
(c) The injected melt filling the injection chamber forces the injection plunger back to an adjustable stop. The pressure of packing can be adjusted and positive volumetric feed provides very accurate metering.
(d) The rotary valve shifts again, blocking the passage from the injection chamber to the stuffer and opens the passage from the injection chamber to the nozzle.
(e) The melt is now injected into the mould.
(f) Full pressure is held on the material until full pressure time has elapsed. The injection pressure then shifts to low pressure injection and hold until the elapsed time of the injection timer. The cycle then begins again.

Description of Firms

Asmidar Plastic Moulding Machines Ltd. Specializes in the manufacture of small injection moulding machines for educational and laboratory work.

Baker Perkins Granbull Ltd. Manufactures its own Hydroplas injection moulding machine but it also represents Triulzi of Milan with its Plastmatic in-line Screw Preplasticizer.

Battenfeld (England) Ltd. Makes a wide range of machines with shot sizes of 1½oz. to 22lb. Vertical and horizontal designs are available, some standard piston types but many with screw preplasticization. An example is the BSM, VP 10/25, a fast-cycling, high-plasticization performance, fully-automatic machine. One of the important features is the steplessly regulated follow-up pressure. The machine is capable of having screw preplasticizer equipment so that the shot size can be increased from the standard 17.6lb. per hour.

BIP Engineering Ltd. Manufactures both normal Bipel piston-type machines as well as screw preplasticizer types. The latter have been designed to fit the base and locking unit of the normal type so that conversion is simple.

Bone Brothers Ltd. Associated with Cravens (Machines) Ltd., who manufactures a single screw preplasticizer unit for adding to conventional machines. The present unit is for machines of about 8oz. capacity. This company manufactures both screw injection units for fitting to existing machines as well as injection machines. One of the latter of advanced design is the 3V-40 20-24oz. vertical injection machine with screw preplasticizer. This enables a very large daylight of 33in. to be achieved with limited floor space.

Bradley and Turton (Injection) Ltd. Manufactures a 64oz. conversion injection unit for fitting to down-stroking compression presses. The unit incorporates a screw preplasticizer with 'up-shooting' plunger injection.

Ed. Brand, Ltd. UK representative for Eckert and Ziegler injection moulding machines.

J. Brockhouse and Co. Ltd. Manufactures the well-known American Lester machines under licence. They are vertical types with the usual advantages with conventional plunger. However, the vertical system enables a heated spreader to be used, giving more homogeneous plasticization. A special feature of the machine is the nylon cut-off to prevent nozzle drool or freezing.

Buhler Brothers (England) Ltd. Produces Swiss machines, the Rover 175 and 350 in particular, with shot capacities of 9oz. and 18oz. One capable of a shot capacity of 90oz. will shortly be available.

Churchill Instrument Co. Ltd. Makes very small machines suitable for the laboratory or small production work (¾oz. size).

Cravens (Machines) Ltd. Manufactures the well-known HPM machines in Britain. Other machines are capable of shots of up to 80oz. and a machine of this type has already been made in the UK. It has a plasticizing capacity of 200lb. per hour for polystyrene and is a preplasticizer type. For this purpose, the machine has two double-acting rams working in smooth bored

steel cylinders. The preplasticizing unit is at an angle of about 30° to the horizontal plunger. The advantages of screw preplasticization are obtained with plunger type operation. Normal plunger type machines are also produced.

Dimon (England) Ltd. Sells the Fimsai screw preplasticizer injection moulding machines using water hydraulics.

Dowding and Doll Ltd. Manufactures on its own account a range of smaller machines and also the Progressive Mercury, an American product for which it has sole representation. The 2oz. machine is an in-line screw type.

The Elgar Machine Tool Co., Ltd. Exclusive distributor of Flesch injection moulding machines in the UK. The machines have a range of capacities from 1oz. to 64oz. and both horizontal and vertical machines with normal plunger or screw preplasticization are available.

Engis Ltd. Makes the Hehland Sohn machines, particularly the small 6-8gm. Arburg machine. This small unit has many of the refinements of the larger types including a dosage unit with self-operating compensator, a correct cylinder for every material, pressure regulator, automatic timing, etc.

Foster, Yates and Thom Ltd. Manufactures some interesting types of machines. One of them is a two-unit type where each unit may be operated independently. The first unit is a 400-ton high-speed horizontally clamped type and the second unit is a 20oz. 'Foster-Wucher' screw-type preplasticizing injection machine. The injection bar can be horizontal or vertical and when operating at high speeds the parting of the mould can be slowed down if required to obtain ejection without damage. A patented piston check valve at the end of the screw prevents back flow of material along the top of the screw flights.

Grilon and Plastic Machinery Ltd. Produces the well-known Rotomat and Neomat injection moulding machines of Netstal of Switzerland.

Hamilton Machinery Sales Ltd. Sells the well-known Ankerwerk and Krauss-Maffei injection moulding machines. The Ankerwerk machines are single screw injection types ranging from 2½oz. up to 32oz. In the Krauss-Maffei range a 32oz. machine is the smallest and the largest is 120oz.

Alfred Herbert Ltd. Manufactures a well-known range of machines including the Herbert 2630 type S 20oz. machine and the Herbert Reed-Prentice 175 T type S 10oz. machine, both self-contained screw types. All the S type machines are screw plasticization, the screw unit incorporating a non-return valve to allow processing to continue during injection.

Hupfield Machinery Sales Ltd. Makes a range of smaller machines from ½oz. up to 4oz. They may be hand operated, semi-automatic or fully-automatic, and in the last two cases there is a self-compensating auto feed. Normal plunger operation is employed but a special spreader ensures maximum heat transference. A non-return valve is provided.

Industrial Plastics Ltd. Supplies the well-known GBF screw preplasticizing injection presses of Italian manufacture.

Denis Leader Ltd. Agent for Jorgensen's Esaco injection moulding machines.

The London and Scandinavian Metallurgical Co. Ltd. Manufactures the Sommer screw preplasticizing injection moulding machines. Interchangeable screws can be used to give different size of shots.

Mortimer Machine Tools Ltd. Exclusive distributor for Stubbe high-production screw piston type injection moulding machines. There are six sizes, ranging from 1½oz. to 63oz. and various screw piston diameters in effect give a total range of 17 machines. Hydraulic operation is employed and the machines are suitable for all materials, including rigid pvc.

Negri Bossi (England) Ltd. This English subsidiary of the well-known Italian firm produces a range of plunger and screw preplasticizer machines.

Pearson Panke Ltd. Supplier of the well-known Hahn and Kolb injection moulding machines.

The Projectile and Engineering Co. Ltd. Peco has always been to the forefront of injection moulding machines development. A wide range of sizes of machines is manufactured which includes various novel features. The most characteristic is the single screw preplasticizing system where the screw is used for plasticization and injection of the melt. This introduces the novel Peco rotothrust system, both for turning the screw and thrusting the ram. The screw and screw heads are steplessly adjustable and are suitable for all commercially available thermoplastics. A non-return valve prevents leakage. There is also an automatic shut-off device for low viscosity materials such as nylon and polythene and the vented hopper base plate allows the escape of volatiles from the feed end of the screw.

S. R. Seymour Ltd. Manufactures a range of small injection moulding machines.

Francis Shaw and Co. Ltd. Produces a ½oz. hydraulic injection moulding machine with a capacity of three shots per minute. The torpedo shape spreader ensures spreading of the material to the cylinder wall. Although small, this machine has all the valuable features of larger equipment.

The Small Power Machine Co. Ltd. Makes particularly small hand machines at a very low price.

F. J. Stokes Ltd. An associate company of F. J. Stokes Corporation of Philadelphia. These injection moulding machines incorporate unique vertical clamping which has many advantages, including the facility for handling inserts.

Turner Machinery Ltd. A unique method of speeding up injection moulding has been devised by Turner Machinery Ltd. The Turnamatic and Rotomatic machines have several moulds on a turntable so that as soon as one injection has been made, the mould moves on and another one takes its place. A valuable feature of this is that it allows thick section mouldings to be produced at a high speed.

Volant Bros. Manufactures the VB 1oz. horizontal hand operated machine with a special attachment for moulding nylon.

R. H. Windsor Ltd. This is one of the best-known British manufacturers, making injection moulding machines ranging from 1oz. to 210oz. capacity. The range of machines include all the very latest developments. For example, the AP.30/115 has a twin screw in-line preplasticizing injection unit incorporating specially designed screws which ensure no bleed-back during injection pressurization. This is only one of many developments.

REFERENCES

[1] W. R. Groves, *International Plastics Engineering*, 1961, **1**, 283.
[2] T. C. Young, *British Plastics*, September, 1955.
[3] Bakelite Ltd., British Patent 796,504.
[4] A. Ripley, *Rubber & Plastics Age*, 1960, **41**, 12.
[5] D. G. Briers, *International Plastics Engineering*, April, 1961, 1.
[6] D. G. Briers, *International Plastics Engineering*, 1961, **1**, 166.
[7] E. Gaspar and M. G. Munns, *International Plastics Engineering*, 1961, **1**, 156.
[8] W. G. Kriner, *International Plastics Engineering*, 1961, **1**, 199.
[9] H. Goller, *Kunststoffe*, 1959, **49**, 531-542.

Dithiol Cure in Chlorinated Butyl

EXTENSION OF APPLICATIONS LOOK PROMISING

By R. HODGES, BSc, AIRI, ANCRT, Esso Petroleum Co. Ltd.

CHLORINATED butyl rubber is a copolymer of isobutylene and isoprene which contains a small amount of chlorine in the molecule. It is prepared by chlorinating butyl rubber under controlled conditions so that the chlorine enters by a substitution reaction rather than by addition and hence little of the unsaturation originally present is lost. The chlorine is believed to enter the molecule in the allyl position, in which, as well as providing an additional reactive site for cross-linking, it activates the double bond.

Chlorobutyl, which is marketed by the Esso Petroleum Co. Ltd. as Butyl HT, is similar in general properties to regular butyl rubber, but the fact that it is unsaturated and contains active chlorine means that it can be cross-linked by a much wider range of vulcanizing agents than can the unhalogenated polymer, and furthermore, it can be vulcanized in admixture with other rubbers.

Fast-Curing Stocks

Of the many curing agents which can be used with chlorobutyl, the dithiols are arousing considerable interest because of the fast-curing high modulus stocks which they produce. It has been reported[1] that bifunctional dithiols will cure natural rubber and SBR but they are not effective with ordinary butyl and, being mercaptans, a number of them have an objectionable odour which could not normally be tolerated. This deficiency can be overcome, however, by using aromatic or substituted aliphatic dithiols.

A number of dithiols have been compared with TMT as vulcanizing agents for chlorobutyl, the compounds used and results obtained being given in Table 1. In the preparation of the compounds a masterbatch containing polymer, stearic acid and carbon black was first prepared in a Banbury mixer and the zinc oxide and either dithiol or TMT were subsequently added on a cool mill. In this study the TMT and the dithiols were used in molecular proportions, and the assumption made that two moles of dithiol were equivalent to one mole of TMT. The validity of this assumption was later confirmed experimentally.

Samples of each compound were cured for 30 minutes at 307°F. and the state of cure was assessed by measuring the equilibrium volume swell in cyclohexane at room temperature. It can be seen that the dithiols give a higher state of cure than does TMT and that the cross-link density tends to increase as the molecular weight of the dithiol increases. Furthermore, in spite of the higher modulus of the glycol dimercapto acetate compound, it has much better ozone resistance than the TMT cured vulcanizate.

Pronounced Odour

Unfortunately, the simple aliphatic dithiols give compounds with a pronounced odour. One of the substituted dithiols, however, glycol dimercapto acetate (GDMA), also known as ethylene glycol bis-thio glycollate, does not have this disadvantage. It is the only dithiol of practical interest at present and is now available from two suppliers in the UK. Table 2 shows the effect of varying the amount of GDMA in the same type of compound. Multiples and a submultiple of the original 1.8 parts were employed and the 30-minute cure time, for which data is given, represents the optimum cure time at 307°F., for each compound.

It can be seen that as little as 0.9 parts of GDMA gives a good cure but that about 1.8 parts is required for optimum properties. The state of cure is very sensitive to concentration of GDMA, above this level the optimum cure time is not substantially altered and physical properties are quite poor. This effect is also shown, but to a much lesser extent, by the TMT vulcanizing system, Fig. 1.

Addition of MBTS to the TMT

THE AUTHOR

RAYMOND HODGES, BSc, AIRI, ANCRT, was born in London in 1929. After taking his degree in Chemistry at Nottingham University in 1952, he joined the technical department of British Insulated Callender's Cables Ltd. at its Leigh, Lancashire, works. While he was with BICC he took a post-graduate course at the National College of Rubber Technology (1954-55). He joined Mersey Cable Works Ltd., Bootle, as chief chemist in 1956, and served on the committee of the Merseyside section of the Institution of the Rubber Industry from 1958 to 1961. Early this year he joined Esso Petroleum Co. Ltd., chemicals division.

TABLE 1

Butyl HT 10-66	100 parts by weight
Stearic acid	1 " " "
SRF black	50 " " "
Zinc oxide	3 " " "
Vulcanizing agent	As incidated

Vulcanizing agent	*Amount used (phr)*	*Weight increase in cyclohexane at equilibrium* %	*Mooney scorch at 260 F.** Ft.	*Ozone resistance† Time to crack* Ft.	*Time to break* Ft.
TMT	1.0	192	6	54	148
1 : 2 ethane dithiol	0.78	190	7	62	180
1 : 3 propane dithiol	0.90	168	10	78	189
1 : 4 butane dithiol	1.02	175	>30	60	160
1 : 5 pentane dithiol	1.03	166	>30	89	187
Glycol di-mercapto acetate	1.83	167	13	129	>370

*Small rotor. Time to 5 point rise above minimum value.
†Samples extended by 50%, placed in 0.2% ozone at room temperature.

TABLE 2

Butyl HT 10-66	100	100	100	100
Stearic acid	1	1	1	1
SRF black	50	50	50	50
Zinc oxide	3	3	3	3
GDMA	0.9	1.8	3.6	5.4
Cured 30min. at 307°F.				
200% modulus (psi)	1,300	1,340	1,100	420
300% modulus (psi)	1,930	2,200	1,920	820
Tensile strength (psi)	2,060	2,210	2,110	1,580
Elongation at break (%)	310	375	340	470
Aged seven days at 250°F.				
200% modulus (psi)	1,170	1,160	720	1,380
300% modulus (psi)	—	1,720	1,210	—
Tensile strength (psi)	1,680	1,840	1,610	1,790
Elongation at break (%)	290	320	420	280

cure system already examined increases the scorch time of the compound and modifies the physical properties to give a very useful combination. The cure curve is flat, heat resistance good and tear strength is high. This vulcanizing system is the one widely recommended for chlorobutyl since it gives the best general balance of properties.

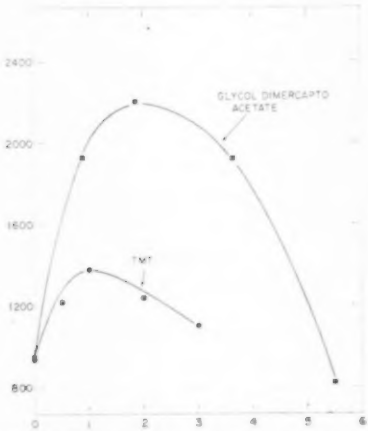


Fig. 1. Effect of concentration of vulcanizing agent on state of cure. Vertical axis gives modulus at 300% elongation psi. Horizontal axis gives parts of vulcanizing agent

Comparison of Cure Systems

The dithiol curing system is compared to the TMT/MBTS combination in an HAF black loaded compound in Table 3. GDMA gives a much higher modulus with lower elongation at break but without very much sacrifice in tensile strength. The tear resistance of the GDMA compound is very much inferior to that of the MBTS/TMT compound but its compression set is outstandingly low. Flexing tests were carried out in accordance with ASTM D 623-52 T using the Goodrich Flexometer. The properties measured were static compression which is the percentage compression suffered by the sample on initial application of the load, dynamic drift which relates dynamic compression before and after the test, permanent set which is a measure of the reduction of height of the specimen as a result of the test, and temperature rise. The dithiol cure gives flexing properties which are superior in all respects to those given by the TMT/MBTS curing system and these good flexing properties are retained after ageing.

Good Ageing

On ageing at 250°F. the GDMA cured compound shows particularly good retention of elongation at break, although, because of the lower initial value, the actual elongation at break at any time during the ageing period is lower than that of the TMT/MBTS compound. At 380°F. the GDMA compound does not show up as well as the TMT/MBTS compound which still retains fair properties and a measure of flexibility after 72 hours, whereas the former compound has cracked badly after 48 hours. The ageing behaviour is shown graphically in Fig. 2. It is interesting to note that after one week's ageing in dry steam at 200psi (388°F.) the GDMA compound is superior, although should any water be present a certain amount of swelling of these black loaded compounds will occur.

In spite of the poor ageing at 380°F. the dithiol cured compound has a unique combination of properties, fast cure rate, very low compression set, good flexing properties and good resistance to temperatures of the order of 200-275°F. This particular combination of very low compression set and good resistance to flexing is hardly equalled by any other curing system in chlorobutyl.

Generally speaking, similar mixing and compounding techniques are used with chlorobutyl as are applicable to unhalogenated butyl. Thus chlorobutyl is responsive to heat treatment but, being more active than normal butyl it can be heat-treated effectively at a lower temperature. Since heat treatment is rapid even at moderate temperatures, promoters do not show up to such effect as with butyl and are not normally used. The choice of temperature for heat treatment is influenced by the fact that at high temperatures there is a

TABLE 3

Butyl HT 10-66	100			100		
Stearic acid	1			1		
Antioxidant 2246	1			1		
HAF black	50			50		
Zinc oxide	5			5		
MBTS	2			—		
TMT	1			—		
GDMA	—			1.8		
Cure time (min. at 307°F.)	20	40	60	20	40	60
200% modulus (psi)	810	860	880	1,810	2,000	2,050
Tensile strength (psi)	2,425	2,420	2,425	2,240	2,265	2,145
Elongation at break (%)	525	490	470	235	220	210
Hardness Shore A	62	65	62	64	65	64
Crescent tear strength (lb./in.)		400			160	
Compression set (%), 70 hours at 212°F. constant deflection		37			18	
Tests on Goodrich Flexometer (212°F., 15lb. load, 30cps, 30min.)						
Static compression (%)		18.3			13.3	
Dynamic drift (%)		7.4			0	
Permanent set (%)		9.2			1.0	
Temperature rise (°F.)		77			50	
Appearance		Porous			Excellent	

	Tensile strength	*Elongation at break, %*	*Hardness*	*Tensile strength*	*Elongation at break, %*	*Hardness*
Aged in air at 250°F. (40min. cure)						
1 week	2,275	350	65	2,025	210	65
2 weeks	1,945	300	68	1,650	200	65
3 weeks	1,750	265	68	1,410	200	65
4 weeks	1,595	255	68	1,350	195	65
Aged in air at 380°F. (40min. cure)						
16 hours	900	360	65	950	300	58
32 hours	560	275	58	495	305	55
48 hours	320	270	60	300	300	53
72 hours	190	195	58	(Samples badly cracked at 48 hours)		
Aged in steam at 388°F. (40min. cure)						
1 week	720	610	43	1,330	415	42

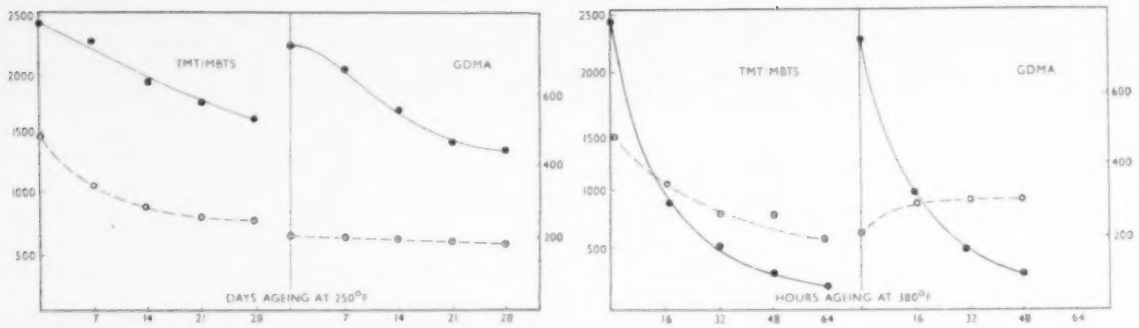


Fig. 2. The effect of ageing on the physical properties of chlorobutyl compounds. Full lines show tensile strengths in psi and broken lines the % elongation at break

tendency for chlorine to be lost from the polymer thus reducing somewhat its activity and the state of cure of the final compound.

Normally, a small amount of an acid acceptor such as magnesium oxide is added early in the mixing cycle and this material is useful as a retarder to control scorch, particularly with the TMT/MBTS curing system. However, even a small amount of magnesium oxide severely retards the dithiol cure and its use is not normally recommended where GDMA is employed.

The absence of an acid acceptor therefore necessitates keeping the mixing temperature low with a GDMA cure, more so than with the types of curing system which will tolerate the use of magnesium oxide.

There is some evidence to show that, far from being merely unnecessary, hot mixing of GDMA cured compounds is definitely undesirable since it can lead to a poor state of cure.

Mineral Fillers

Chlorinated butyl may, of course, be compounded with mineral fillers instead of carbon blacks and GDMA has been examined in mineral filled compounds. They do not, however, give the high modulus of the black loaded compounds. The type of filler used will influence the ageing properties of the compound and, of the non-black fillers, fine particle talcs, hard clays and whitings are best for high temperature applications involving dry heat. Hard clays, however, have to be used with care in chlorobutyl compounds, firstly because hot mixing with such fillers can lead to a degree of depolymerization of the polymer and secondly because clay loaded dithiol cured compounds tend to be scorchy. Calcined clays are useful because they give low compression set. Whiting, of course, gives rather poor physical properties and surface coated calcium carbonates strongly retard the cure of chlorobutyl and are not recommended.

Slower Cure Rates

The rate of cure obtained with mineral fillers is somewhat slower than is the case when carbon blacks are used although the cure curves

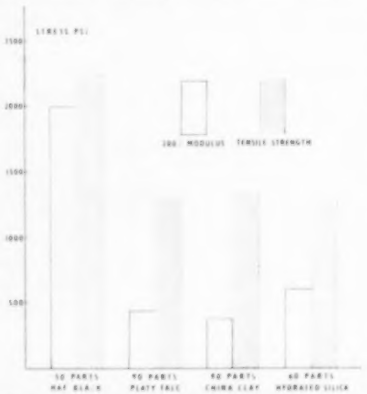


Fig. 3. Physical properties imparted to chlorobutyl by various fillers

retain the characteristic flat 'plateau'. An indication of the modulus and tensile strength which could be expected from GDMA cured mineral filled compounds compared with HAF black is shown in Fig. 3.

Conclusion

Glycol di-mercapto acetate is a vulcanizing agent for chlorobutyl which gives fast curing compounds with high modulus, low compression set and good flexing properties. A cure of only 20 minutes at 275°F. will give a vulcanizate with low compression set and with exceptional ozone resistance.

Most dithiols impart an objectionable odour to the compound. GDMA, which is now available from two UK suppliers, does not suffer from this disadvantage and provided no excess unreacted material remains after cure, it gives a compound with little residual odour. GDMA as a vulcanizing agent for chlorobutyl has not been investigated as fully as certain other systems but the unique combination of properties which it confers promises to extend the field of applications of butyl elastomers. It enables a snappy, resilient compound to be produced from chlorinated butyl and such compounds are finding use in applications where the valuable properties normally associated with butyl, together with the high modulus and quick recovery from deformation not normally obtainable with butyl, are required.

A number of trade names mentioned in the article, including Santoflex and Flectol, are registered trade marks.

REFERENCE

[1]C. M. Hull *et al.*, *Ind. Eng. Chem.*, 1948, **40**, 513.

Long on the Shelf

Virtually unlimited shelf life is claimed for a new plastics pack for BP Comprox — a liquid detergent now being marketed in Australia. The pack, which recently won an award in the National Packaging Association of Australia contest, is blow-moulded from Rigidex Type 3 — a copolymer of high density polythene with a very high resistance to environmental stress cracking.

Environmental stress cracking has long been recognized as a phenomenon of the behaviour of many types of polythene. In the presence of such chemicals as liquid detergents and wetting agents the problem becomes more acute, and can even lead to fracture of the package. British Resin Products, which markets Rigidex Type 3, says it has been developed to overcome this problem while retaining the other properties of the material — low permeability, good impact strength, and processability — which have established it in the field of blown containers.

Polymer Scholarship

Melvin MacIsaac, of Sarnia, Canada, has won a $4,000 scholarship awarded annually to sons and daughters of employees of Polymer Corp., Sarnia.

Organotin Stabilizers

JAPANESE COMPETITION MAY REDUCE PRICES

By H. VERITY SMITH,
Meister AG, Basle

THE use of organotin compounds as stabilizers for vinyl resins was first developed in the United States, by the Union Carbide Organization, during the early 1940s. They first became commercially important after the war, and by the early 1950s American production was of the order of 400 tons per annum.

The first production on this side of the Atlantic was in England, in the early 1950s, by Pure Chemicals Ltd. and BX Plastics Ltd. The latter company manufactured organotin stabilizers for its own use. Since that time a number of other companies have entered the field, including Noury and van der Lande in Holland, Oxydo, Kautschuk Gesellschaft and Deutsche Advance Produktion in Germany, Commer in Italy, Rhone-boulenc in France, Albright and Wilson in England, and Meister AG in Switzerland.

Intermediates

The synthesis of organotin compounds is a somewhat complicated process, and by no means all stabilizer manufacturers make their own intermediates. Among the more important European manufacturers of organotin intermediates are Pure Chemicals Ltd., Farbwerke Hoechst and Meister AG.

Production of organotin stabilizers in Europe is now running at about 500 tons per annum, while production in the United States has steadily declined and is now running at a very low level. Almost all authorities in the United States are agreed that organotin stabilizers are, if not dead, moribund, and that they have no future. This may well be true of the United States, but there is no sign of such a tendency in Europe. The division of opinion on this point between Europe and America is so marked that the reasons for it are worth investigating.

There are still some applications and processes for which no satisfactory alternative to the organotin stabilizer has yet been developed. These applications and processes are, however, much more important in Europe than in the United States. An example is the injection moulding of unplasticized straight homopolymer pvc. In the United States rigid vinyl injection mouldings are usually made with rubber modified pvc, which has a lower moulding temperature than straight pvc.

Toxicity

While octyltins are regarded in Europe as non-toxic, and are used for transparent rigid and semi-rigid applications, the American industry, influenced by the refusal of the USSDA to consider octyltin stabilizers as non-toxic generally avoids making transparent non-toxic products from vinyls.

Where it is technically possible to use either an organotin or a barium cadmium, the actual commercial choice will, of course, depend on cost.

In Europe a good organotin stabilizer (sulphur type) sells at about 22s. per lb., while a good liquid barium/cadmium stabilizer sells at about 5s. 6d. per lb. They should therefore be compared for any application to which both are suited, in the ratio of 0.5 parts of organotin stabilizer phr to 2 parts of barium/cadmium stabilizer phr.

In the past, such a comparison would, in cases where either type of stabilizer was technically suitable, have resulted in the choice of the barium/cadmium, and the decline in American organotin stabilizer consumption, which began about five years ago, can be traced to this.

Improved Quality

Recent considerable improvements in the quality of European organotin stabilizers, however, have induced many European processors to re-evaluate them in comparison with barium/cadmiums; as a result, it seems likely that the rate of increase of European organotin stabilizer consumption is in fact beginning to accelerate.

It is indeed possible that the Americans virtually abandoned the organotin stabilizers at the wrong moment in their development.

The most significant lines of development in organotin stabiiizers are: —

(1) Improved efficiency permitting lower and more economic doses.
(2) Improved processability permitting wider application.
(3) Reduced smell.
(4) Improved storage stability.

The problem of improving efficiency is simply one of synthesizing all the structures likely to be effective and testing the resulting compounds as stabilizers in several different types of pvc formulation. This is an empirical approach but seems to be the only possible one, though a certain amount of inspiration in the choice of structures to be synthesized is a great help. The more recent develop-

THE AUTHOR

H. VERITY SMITH, BSc, was born in 1922 of Yorkshire parents living in exile (in Wiltshire). He studied chemistry at Manchester under Michael Polanyi and Sir Alexander Todd (BSc, 1943) and theatre under Joan Littlewood. Beginning his plastics career under T. T. Clarke at Wallington, Weston and Co., he then managed the pvc section of Lorival Plastics, where he studied under F. E. Lowe and John Barbirolli. He joined N. A. Hornstein and R. L. Barker in the first introduction (by Pure Chemicals Ltd.) of organotin stabilizers in Europe. After starting the plastics division of Yorkshire Copper Works (now Yorkshire Imperial Metals) he returned to Pure Chemicals and worked in close liaison with Ferro Chemical Corp. At present managing director of Meister AG, Basle, stabilizer manufacturers, he is author of numerous publications and patents in the vinyl stablizer field. Hobbies: three kids, hi-fi and writing a book on pvc technology which is unlikely ever to be finished.

ments have certainly brought much greater efficiency and doses of 0.5 phr and less are becoming more common.

It is, however, difficult to determine the practical efficiency of an organotin stabilizer as distinct from what may be termed its 'intrinsic stabilizing potential.' The intrinsic stabilizing potential is quite easy to determine by quickly milling a test compound and ageing it in an oven, or by casting a plastisol and ageing the resulting film in an oven.

Simple Test

Neither of these methods gives any idea of the calendering properties, extrusion characteristics, or, in fact, of the practical value of the stabilizer, except in plastisols. Experiments with high speed mills are of value in assessing the probable calendering properties of a compound, but evaluation on production scale plant is absolutely necessary.

A simple test has, however, been devised to measure the tendency of the stabiliser to cause sticking to the mill rolls. This work is part of a general study of processability of pvc compounds, and will be the subject of a later paper.

The organotins in general have a tendency to cause sticking of the compound to mill rolls, calender rolls, extruder dies, etc. This tendency, by increasing the development of frictional heat in the compound, tends to nullify the effect of the stabilizer. The intrinsic heat stabilizing action may be good, but if too much frictional heat is developed during processing, the resulting heat stability will be inferior. The heat developed by the shearing action in the nip, caused by the collision of two streams of material each adhering strongly to one of the mill rolls, is very considerable. Further, this heat is developed within the material and is not conducted away.

Inadequate Lubrication

This defect of the organotins has long been known, as has the difficulty of arranging for adequate lubrication to counteract it. What was wanted was the development of an organotin stabilizer without the sticking tendency. In view of the tendency towards more and more powerful organotins used at lower and lower doses, it was no use trying to dilute the stabilizer with a lubricant. Further, the more powerful the intrinsic stabilizing potential, the more marked in many cases became the sticking action.

The next line of research, therefore, was to develop organotin structures having a high intrinsic stabilizing potential without the tendency to cause sticking of the pvc compound to the mill rolls.

This Meister has now succeeded in doing, and one of our new types can be milled at high temperature for at least an hour in an unplasticized formulation, without any added lubricant at all. These new types have all the desirable properties of the more powerful 'sticking' types of organotins without the tendency to stick. Examined by dynamic test methods, their stabilizing action appears to be better than that of the standard products, though this is in fact an illusion due to the superior processing characteristics because in fact their intrinsic heat stabilizing potential is slightly lower than that of the sticking types from which they were developed.

We are now test marketing two of these products, Z25C—a butyltin, and 0Z8C—a non-toxic octyltin, both for unplasticized applications.

Objectionable Smell

In the early days, the biggest objection to organotin sulphur compounds was their smell. This has now been found to be due almost entirely to impurities. The pure compounds have practically no smell when freshly made; they are, however, subject to hydrolysis in moist air and this causes the smell to get much worse. This defect is common to all organotin sulphur compounds and can be minimised by keeping the drum tightly closed.

If the compound does not hydrolyse in moist air, the stabilizing properties are found to be poor. We are, however, developing agents which inhibit this tendency, and it appears likely that this will enable us still further to reduce the odour. Fortunately, the odour does not usually persist in the finished product, and there is no further hydrolysis once the vinyl material has been compounded.

Non-Toxic Series

A purely European development in organotin stabilizers has been the introduction of the non-toxic octyl series. The work of Barnes and Stoner, of Klimmer and of Berger, has shown that the di- and tri-octyltin compounds are substantially non-toxic. The importance of the non-toxicity of the tri-octyltins cannot be overstressed. The ordinary commercial organotin stabilizers are based on dibutyltin compounds. There is no evidence that pure dibutyltin compounds are at all toxic, but no manufacturer can guarantee that his dibutyltin stabilizers do not contain a very small amount of tributyltin compounds. And the tributyltin compounds are known to be highly toxic.

In the octyltin series, however, it has been shown that both the di- and tri-octyltins are non-toxic so the presence of very small amounts of tri-octyltin in di-octyltin stabilizers does not matter.

Unfortunately it seemed until recently that the octyltins, in addition to being more expensive, were also much less efficient than the dibutyltins as stabilizers. Dioctyltin maleate, laurate and bis-(mono octyl maleate) are all inferior to their butyl anologues, to an extent which makes stabilization with them more than twice as expensive as with butyltins.

Interesting Discovery

We had come to the conclusion that the octyltin structure was fundamentally inferior to the butyltin in respect of stabilizer activity. Then we made an interesting and, we think, far reaching discovery. We prepared the butyl and octyl analogues of a particular structure, and found that the octyl was the more powerful as a stabilizer. This octyltin compound was then compared with all the butyltins available, and found to be the best heat stabilizer of which we are aware. This material is now being marketed, with gratifying results, as Meister OZ8. This stabilizer gives equal performance with a good butyltin at the same cost per kilo of resin or superior performance to a good butyltin at the same weight dosage.

Foodstuffs Applications

It is likely that in the course of time most of the European public health authorities will approve the octyltins for applications involving contact with foodstuffs, probably following the lead of the German Bundesgesundheitsamt. The time interval from country to country is likely to be very variable, as international cooperation in this field is nil. It would be rash to suggest that international cooperation would accelerate the acceptance of new materials, but it might result in the gradual emergence of order out of chaos.

The greatest single obstacle to the development of vinyl plastics in the field of food packaging, water distribution, food preparation and manufacture, etc, is the attitude of the public health authorities in the different countries. The substances allowed and disallowed by the various European national authorities seem to have been selected at random. The whole picture is admirably illustrated

Continued on page 677

Compounding Developments

SELECTION OF ANTIOZONANTS FOR SERVICE CONDITIONS

By C. H. J. AVONS, FIRI,
Monsanto Chemicals Ltd.

WHILST many important compounding developments have taken place in recent years, it is considered that two of the most important have covered the chemical modification of general purpose rubbers and improved antiozonant protection. Consequently, it is proposed to deal in detail with these two developments rather than attempt a more general and less informative survey covering polymers, carbon blacks, oils, etc.

THE AUTHOR

C. H. J. AVONS, FIRI, was born in Melksham, Wiltshire, in 1913. He joined the Avon India Rubber Co. Ltd. in 1929, where he trained as a laboratory and technical assistant. He achieved the AIRI in 1939. Subsequently he went to St. Helen's Cable and Rubber Co. Ltd. as chief chemist and was appointed technical manager in 1948. His FIRI was awarded in 1955. He has served on many technical committees associated with the activities of the BSI, FBRAM and CMA. For ten years he has been an active member of the Institution of the Rubber Industry, London Section, and was chairman 1958-60 serving on council, executive and finance committees. He joined Monsanto Chemicals Ltd. at their Fulmer Research Laboratories in June 1960 as senior rubber technologist.

Modifying Agents for Rubber

Since the early work of Gessler and his co-workers[1,2,3,4,5] on the promoted heat treatment of rubbers, chemical modifiers such as p-dinitrosobenzene (Polyac) and N,4-dinitroso-N-methylaniline (Elastopar) have both proved important for improving the processing and physical properties, particularly resilience, of butyl rubber. With the use of the latter product, however, significantly reduced scorching tendencies have been found.[6] The commercial application of this work has contributed substantially to the successful introduction of the butyl passenger tyre.

For heavy duty truck tyres, high resilience is of the utmost importance because excessive heat generation during running can result in tread separation. This requirement has only been met, up to the present, by natural rubber - based tread compounds. Economies in truck tyre production could be made by replacing all or part of the natural rubber by SBR if hysteresis could be reduced by compound modification. Therefore, some compounding studies were undertaken to investigate the use of N,4-dinitroso-N-methylaniline in NR/SBR blends.

Using a size '00' Banbury mixer with an approximate batch size of 2,100gm, a series of tyre tread compounds was produced with natural rubber and SBR. The chemical modifier was added with the carbon black to react in the Banbury at a temperature of 340°F.-370°F. and the batches were completed on a cool mill by addition of sulphur and accelerators. The actual mixings used are given in Table 1.

Comparative tests were carried out on these compounds to check scorch and physical properties, including heat build-up and hysteresis. Results obtained are given in Table 2.

The beneficial results indicated by the Goodrich Flexometer test and torsional hysteresis are apparent. At the levels of 0.5phr and 1.0phr used, the results obtained with the 50/50 blends of NR/SBR are somewhat superior to those obtained with natural rubber alone. The higher heat build-up of the unmodified SBR compound is clearly shown.

The overall effect of adding N,4 - dinitroso - N - methylaniline is therefore to produce a compound showing reduced hysteresis which, in turn, leads to reduced heat build-up during flexing. This effect is brought about by modifying the interaction of carbon black/elastomer during compounding in an internal mixer at temperatures of 300°F.-370°F. The interaction may be both physical and chemical, the former by assisting the dispersion of the black particles and the latter by strengthen-

TABLE 1
TEST COMPOUND FORMULATIONS

Mix Reference	*A*	*B*	*C*	*D*	*E*
S. sheets	100	50	50	50	—
SBR 1500	—	50	50	50	100
ISAF black	40	40	40	40	40
Zinc oxide	5.0	4.5	4.5	4.5	4.0
Stearic acid	3.0	2.5	2.5	2.5	2.0
Process oil	3.0	4.0	4.0	4.0	5.0
N,4-dinitroso-N-methylaniline	—	—	0.5	1.0	—
N-tert-butyl-2-benzthiazyl-sulphenamide	0.5	0.85	0.85	0.85	1.2
Sulphur	2.5	2.13	2.13	2.13	1.75

TABLE 2
COMPOUND PROPERTIES

Mix Reference		*A*	*B*	*C*	*D*	*E*
Mooney at 135 C.						
Viscosity — ML4		26	24.7	29.0	34.6	34.0
Scorch — T(L + 10)		15.1	23.1	23.6	19.4	33.9
Cure at 144 C.	*min.*					
Tensile strength, psi	45	4,450	3,486	3,420	3,000	3,300
	60	4,000	3,850	3,260	2,940	3,230
Elongation at break, %	45	500	460	400	470	460
	60	500	450	400	370	420
Modulus at 300%, psi	45	2,230	2,240	2,300	2,530	1,790
	60	2,060	2,240	2,300	2,540	1,950
Torsional hysteresis, log. dec.	45	0.096	0.114	0.087	0.083	0.123
	60	0.109	0.122	0.084	0.082	0.104
Goodrich Flexometer	60					
△T C.	—	19	21	18	18	23
△H in.	—	0.074	0.048	0.039	0.026	0.056

ing the bonds between the carbon black and the rubber.

The modification to the carbon black/rubber structure is normally obtained with a minimum of secondary effects such as a rise in stock plasticity or an increase in rate of cure. Under some factory conditions, however, a slower extrusion speed may result through the small increase in stock plasticity, but this can usually be remedied by adopting pre-masticated rubbers for mixing. The slight activation in cure noticed may require a 10% to 20% reduction in accelerator level.

Antiozonant Protection

The role of ozone in causing rubber to crack is now better understood as a result of investigations carried out by several workers in this field.[9 10 11]

It is generally appreciated that different groups of antiozonants behave in different ways to reduce or control the rate of ozone cracking in a rubber compound. Selected waxes continue to act as excellent antiozonants for rubber exposed to static conditions with the surface film formed by blooming acting as a barrier to the ozone as long as it remains undisturbed.

Several derivatives of p-phenylene diamine have been produced and marketed which increase the critical stress required for crack initiation and thus reduce the number of cracks formed at low strains. One other group — 6 - alkoxy - 2,2,4 - trimethyl-dihydroquinolines — has been found to yield a useful product which reduces the rate of cracking without affecting the pattern of cracking. These three groups can be discussed briefly as follows:

Waxes

The selection of suitable grades of wax is extremely important, and available evidence[12] suggests that the only satisfactory way to check their antiozonant properties is to carry out static exposure tests. This selection also depends on climatic conditions since, although waxes with a melting point of 65°C.-70°C. appear satisfactory for the United Kingdom, colder climates generally require a lower melting point wax and warmer climates a higher melting point wax. The most effective waxes appear to be those made by blending paraffinic and microcrystalline waxes to produce the most desirable combined properties.

Waxes are useful under static conditions, but under continuous dynamic conditions they may actually increase the severity of attack due to rupture of the wax film concentrating the ozone effect.

It has been found, however, that under intermittent dynamic testing, confirmed by experience with tyres, waxes do impart added resistance because of the film re-formed on the surface of the rubber during static conditions.

P-phenylene-diamine Derivatives

These confer excellent protection against ozone cracking under dynamic conditions and also reduce ozone attack at moderate strains up to 20% under static conditions. Various derivatives have been studied for their antiozonant performance in rubber, and a comparison of some of the most useful is given in Table 3.

TABLE 3

COMPARISON OF P-PHENYLENE DIAMINE DERIVATIVES

Derivative	*Physical Form*	*Efficiency*	*Comments*
N-N′-diphenyl ppd ..	Solid	Moderate	Blooms at 0.3phr
N-cyclohexyl-N′-phenyl ppd	Solid	Good	Blooms at 1.0phr
N-N′- dioctyl ppd	Liquid	Good	Tendency to reddish discoloration when used above 2phr
N-isopropyl-N′-phenyl ppd	Solid	Excellent	Rated at 20% more effective than other types. No bloom up to 2.5phr

The efficiency of N-isopropyl-N′-phenyl-p-phenylene diamine (Santoflex IP) compared with other derivatives under severe conditions of either continuous or intermittent dynamic stress is outstanding, and several workers have substantiated this fact both in natural rubber and SBR.[9 13] This antiozonant is very effective and, as already stated, one characteristic property is to increase the critical stress required to cause crack propagation.[10 11] It therefore follows that, although protection is generally excellent with p-phenylene diamine derivatives, there is a risk of the formation of a few deep cracks at low strains, especially when marginal quantities of antiozonant are used.

6-Alkoxy-2,2,4-Trimethyl-Dihydroquinolines

The only commercially important product in this group is 6-ethoxy-2,2,4 - trimethyl - 1,2 - dihydroquinoline (Santoflex AW). It is a viscous liquid with a slight activating effect on cure if used in high concentrations.

This derivative has little effect on the critical stress required to cause crack propagation, but it reduces the rate of crack growth. The effect of this antiozonant on rubber is to stabilize a network of many fine cracks and to limit the formation of deep cracks. In this way, therefore, the protection is complementary to that offered by wax and N-isopropyl-N′-phenyl-p-phenylene diamine, and combinations of all three have useful applications.

This brief review of the most important antiozonants developed for use in rubber compounding indicates the possible selection of the type or types best suited for any particular application after a careful study has been made of specific service requirements.

Recommendations

Conditions generally fall within the following categories:

Static Strain

Products such as hose, window sealing, cables and grommets are usually subjected to some static strain in service. Suitable economical compounds should therefore include 2phr to 7phr of selected wax to combat ozone attack on the surface of the rubber, and preferably 1phr to 2phr of 6 - ethoxy - 2,2,4 - trimethyl - 1,2 - dihydroquinoline to reduce the growth rate of any cracks formed. Alternatively, 0.5phr of N-isopropyl-N′-phenyl-p-phenylene diamine can be used equally successfully with the wax content recommended. If staining problems have to be considered, however, then it is usual to incorporate wax only.

Continuous Dynamic Flexing

Continuous flexing conditions are encountered with conveyor belts, driving belts, rollers and roller conveyors and certain types of flexible hose. In some of these products the presence of wax could definitely be harmful, and the best level of protection can be achieved by combining the use of the other two antiozonants, one to reduce the incidence of cracks and the other to control the rate of crack growth once it has started. For a typical V-belt compound, the following combination can be recommended: N - isopropyl - N′ - phenyl - p - phenylene diamine 1.0phr, 6-ethoxy-2,2,4 - trimethyl - 1,2 - dihydroquinoline 1.0phr.

In addition, the presence of a similar proportion of a good antioxidant such as polymerized 2,2,4-trimethyl-1,2-dihydroquinoline (Flectol

H) will control any degradation caused by heat build-up under running conditions.

Intermittent-Dynamic Flexing

Although the best product example undergoing such service conditions is undoubtedly the tyre sidewall, other items such as rubber suspension units on cars, gaiter bellows, buffer units, bridge mountings, etc., all sustain frequent periods of alternating strain and rest.

In particular, the tyre sidewall is subject to ozone attack in storage and when the vehicle is stationary (static), and also under running conditions (dynamic). Tests were therefore carried out on a typical SBR sidewall stock using the antiozonants singly and in combination, allowing the test samples to run all day followed by resting all night. The samples consisted of belts which were prepared from extruded stock moulded into rectangular section rings 5in. o/d x ½in. wide x ¼in. thick. These were assembled over 1in. dia. pulleys for flexing at 256 cycles per minute under a strain range of 0-14%. When at rest, the belts were adjusted so that the same part was always under static strain. Ratings were assigned to the degree of cracking on the belt surfaces which were under stress whilst at rest.

Table 4 shows the crack ratings assessed visually on all the samples.

Subsequent tests made under an extensive tyre testing programme confirmed the laboratory tests quite conclusively and clearly indicated that best results were achieved by incorporating all three types of antiozonant in the rubber. In addition, the adoption of an intermittent/dynamic belt test was shown to simulate most closely the actual service conditions under which a tyre is run.

TABLE 4

CRACK RATINGS

Antiozonant	*Proportions Used, phr*								
Selected wax	–	2	–	–	–	2	2	2
6-ethoxy-2,2,4-trimethyl-1-2-dihydroquinoline	–	–	2	–	1	2	–	1
N-isopropyl-N'-phenyl-ppd	–	–	–	1	0.5	–	1	0.5
Crack rating after 1,000hr. test	E	C	6	6	4	5	4	1

The crack ratings were assessed visually as follows:

0 1 2 3 4 5 6 A B C D E

→ increased cracking

0 = No cracks. 1 = Cracks just visible under ×20 magnification. 6 = Mainly visible cracks between $\frac{1}{16}$in. and $\frac{1}{8}$in. long.

REFERENCES

[1]Gessler, *Rubber Age*, 1953, **74,** 59.

[2]Zapp and Gessler, *Ibid.*, 1953, **74,** 243.

[3]Gessler and Ford, *Ibid.*, 1953, **74,** 397.

[4]Rehner and Gessler, *Ibid.*, 1954, **74,** 561.

[5]Gessler, Wiese and Rehner, *Ibid.*, 1955, **78,** 73.

[6]Leeper, Gable, D'Amico and Tung, *Rubber World*, 1956, **135,** 413.

[7]Zapp, *Proc. IRI*, 1958, **5,** 172.

[8]Schallamach, *Rubber J. Int. Plast.*, 1959, **137,** 566.

[9]Thornley and Watts, *Proc. Int. Rbr. Conf.*, 1959, p. 190.

[10]Vodden and Wilson, *Trans. IRI*, 1959, **35,** 82.

[11]Braden and Gent, *J. Applied Pol. Science*, 1960, **3,** 90.

[12]Ferris *et al.*, ASTM Special Tech. Publication No. 229, p. 72.

[13]Smith, *Rubber Age*, 1959, **85,** 96.

Extensive use is made of Formica woodgrain laminates in the Floline range of office furniture made by S. R. Sawyer Ltd. The executive desk and Long John table illustrated have Teak woodgrain laminate on all surfaces

Russian Tyre Factory for Ceylon

AS reported in *RPW* September 30, 496, a contract has been signed between the Government of Ceylon, and the USSR, to set up a State factory for the manufacture of rubber tyres and tubes. The selected site is Philmount Estate, Kelaniya, about five miles from Colombo.

The construction of the factory will be done by Ceylonese engineers with Soviet assistance, and work is expected to start next year. The factory will be completed in 1964 and in production in 1965. Maximum annual production capacity will be 360,000 tyres and a corresponding number of inner tubes and flaps.

The establishment of the factory will be in two stages. The first stage will allow the production of 250,000 tyres per year. Of this number 81,000 will be tubeless tyres and 169,000 tyre casings for tubed tyres. 152,000 inner tubes and 88,000 flaps will be made and raw rubber consumption will be 2,600 tons per annum. The second stage will provide for the expansion of production to full capacity, which will be made up as follows: tubeless tyres 135,000, tyre casings 225,000, inner tubes 206,000, flaps 144,000. Annual raw rubber consumption will be 4,300 tons.

In stage 1, 65% of production will be passenger car tyres and 35% truck sizes, and in the second stage the ratio will be 60/40.

The factory is expected to provide employment for 551 people initially, rising to 658 when full production is under way. The engineers, technicians and workmen holding key positions will be trained in tyre factories in the Soviet Union.

Under the terms of the agreement the Soviet Union will:

(1) Supply the working drawings for construction of the main factory building and some auxiliary buildings, for erecting the plants and equipment, and for the auxiliary services.

(2) Supply the technological equipment, electrical equipment and materials, as well as the necessary materials for fabricating parts of the equipment locally.

(3) Supply building equipment including cranes, rollers and tractors, as well as building materials including cement and fabricated steel components for the main factory building.

(4) Depute experts to supervise and assist in the construction of the factory, in erecting the machinery and equipment, and in commissioning the plant.

Dip-Coating in Plastics

ADVANCES IN BOTH MATERIAL AND MECHANIZATION PROCESSES

By F. L. HATE, Telcon Plastics Ltd.

A FAMILIAR pattern in technology is the coming together of two lines of research at an opportune moment. A notable instance of this is the development of radar in the years before the Hitler war. The engineers were ready to go; what was needed was a cable-insulant having the necessary low-loss characteristics plus toughness and flexibility. And there, precisely when it was needed, was polythene, still something of a chemical curiosity, although it had already been produced by its discoverers at I.C.I. in sufficient quantities for the Telegraph Construction and Maintenance Co. (Telcon) to insulate some experimental lengths of cable with it. The use of polythene in radar cables was a potent factor in the winning not only of the Battle of Britain, but of the whole war, yet, during those years, it was virtually unknown to the general public.

By the time the facts had been published abroad after the war, some intensive development work had been carried out on polythene, and, among the discoveries made by Telcon was a method for converting it to a powder, such powder being made commercially available in 1946 for the hot-dip-coating of metal articles. The process as originally described appears elementary to the point of crudity, but it embodies the basic principles of all powder-dip-coating. It consists in heating the metal article to a temperature above the melting point of polythene, usually to about 200°C., and immersing it in a pile of the powder, some of which melts on to the metal surface, causing further powder to adhere. The article is withdrawn, freed from loose powder and heated once more, to fuse the adhering powder to a smooth continuous film. This simple method is still employed quite effectively for small-scale and experimental coating work, but it is obviously inadequate if uniformity of coating thickness and surface finish, especially on articles of complex shape, is to be guaranteed, and the process operated at an economical speed.

The adaptation by Knapsack Griesheim AG of the principles of powder fluidization to the coating process was a major step forward. Here, in fact, was the second of two elements, the first being the availability of a polythene powder of suitable particle shape and size. The two coming together enabled powder dip-coating to become a commercial proposition on a large scale, and to warrant consideration along with stove-enamelling, plating, etc., as a standard method of industrial finishing.

The powder on which the work in Germany was originally done was, in fact, high density polythene, this being produced as a powder polymer by the low-pressure Ziegler process. The principle of fluidization had been known since 1919, but its use had hitherto been confined to the mixing of powders and the catalysis of chemical reactions by bringing the reactants into intimate contact. Fluidization, which must not be confused with melting, is achieved by passing a diffused upward current of air through the powder, contained for the purpose in a tank with a porous base, below which there is a compartment connected to a low-pressure blower. What happens is shown diagrammatically in Fig. 1.

As the air pressure in the lower compartment, or air-chamber, is increased, the velocity of the air passing through the powder increases proportionally. At low rates of flow, the air can find its way through the spaces between the powder particles without disturbing them, but, as the flow increases, a point is reached at which the powder particles become buoyant in the air stream, and the volume of the powder mass begins to increase. In this state the powder behaves very much as a liquid. Articles can be plunged into it with great ease, and the powder flows round them, penetrating into their corners and interstices, giving uniform coverage with a minimum of agitation of the articles themselves in the powder mass.

The shape and size of the powder particles exerts a considerable influence on the fluidization process. Ideally, the particles should be of spherical shape, so that they flow freely, with a minimum of agglomeration. High density polythene powder particles are of this type, and can be fluidized smoothly without difficulty. Low density polythene, however, like some of the other powders which have since come into use for dip-coating, deviates sufficiently from the ideal as to cause defects in fluidization, the chief of these being 'channelling', otherwise known as 'volcano-ing' or 'spouting'. This occurs when the air flow, instead of being uniformly diffused, begins to make paths for itself through the powder mass.

Mechanical Agitator

Because of the tendency of the powder particles to cling together, these paths, once established, are maintained, so that the air escapes from the powder in a series of spouts, each carrying a certain amount of powder with it (Fig. 2). It is not always possible to vary the powder itself to improve its fluidizing capabilities, nor is this always desirable,

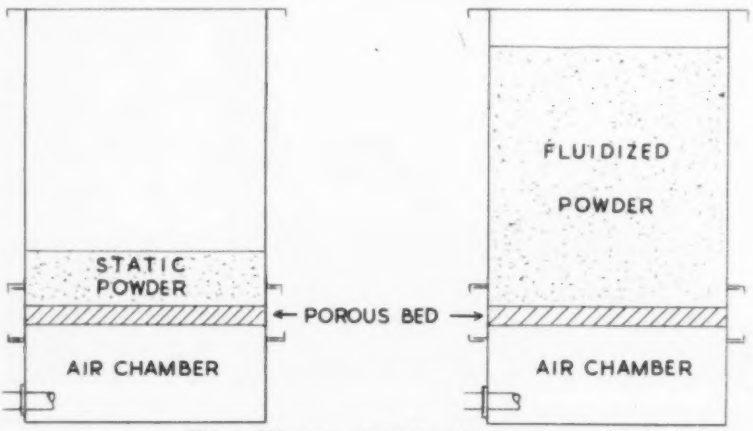


Fig. 1. Diagram of fluidization process

Fig. 2. 'Volcanoes' caused by defective fluidization

as an ideal fluidizing powder is not necessarily ideal for dip-coating. One of the best ways of overcoming channelling is the incorporation in the tank of a mechanical agitator, which breaks up agglomerates and sets up turbulence in the powder (Fig. 3).

The base of the fluidizing tank is usually composed of porous ceramic tiles with a pore size of about 50 microns. The air is best supplied from a high-speed blower. The pressure required is only about 1psi and the actual quantity of air needed is approximately 125 cu. ft. per hr. per sq. ft. of base area. Telcon Plastics Ltd., which came into existence this year as a separate company within the BICC Group to take over all the plastics interests of the Telegraph Construction and Maintenance Co., produces a fluidizing tank incorporating all the principles described. Another feature of this particular unit is that the fluidizing tank, with its porous base, can be detached bodily from the air-chamber, run out on rails, and substituted by another. This facilitates changes of powder and colours, and means that several comparatively inexpensive tanks can be used in conjunction with one master-unit. Telcon is the sole licensee, in the UK for the Knapsack-Griesheim patents covering the fluidized bed method of dip-coating.

The other essentials for powder dip-coating are, of course, facilities for heating the articles before and, if necessary, after dipping. Static or conveyorized ovens can be employed for this purpose, the latter obviously being essential for large scale production. The articles naturally have to be suspended in the oven, either by a hook, or, as in the case of most wire articles, by a fine wire. This latter is subsequently cut off, and, if care is taken in this, only a very small mark is left, which can be completely obliterated later by a simple tooling or sealing operation.

A static batch-oven, for articles to be dipped into low-density polythene, operates at a temperature between 200°C. and 300°C. The temperature is governed by the thermal capacity of the articles, the most convenient heating time and the thickness of coating required. An article constructed from thin wires will loose more heat in transference from oven to dipping tank, and in the actual dipping, than will a large solid block of metal, and the temperature to which such an article must be raised before dipping must of necessity be somewhat higher, usually in the region of 250°C. On the other hand, a bulky solid item needs to be heated to a temperature no higher than 200°C. A conveyorized oven is often run at temperatures up to 500°C., and the speed of travel of the articles through it is regulated so that they emerge at the optimum temperature for dipping, and heated uniformly throughout.

After dipping, the fusion of the powder on the article into a smooth coating, especially if the article has a high thermal capacity, can be seen to be taking place without further heating, almost immediately on removal from the dipping unit. This process seldom proceeds to completion on wirework, however, and a second heating stage is necessary to cause the semi-fused powder to flow into a smooth coherent coating. A batch oven for this process would normally operate at about 180°C. for articles dipped into low-density polythene powder, and a conveyorized oven at a correspondingly lower temperature as compared with its counterpart on the pre-heating side.

Until the advent of high-density polythene, the low-density material was the only plastics powder available for dip-coating, and its merits as a protection against corrosion, its flexibility and durability, and its ability to take a wide range of colours, enable it to hold its own as a good all-round coating medium, especially as any slight difficulties in fluidizing it were soon overcome. It is used extensively for the coating of domestic wireware, and gives an extremely pleasant finish to crockery drainers, trays, flower baskets and bathroom fittings. One of its earliest applications was the coating of electro-plating jigs, where the acid-resisting qualities of the polythene constituted a most important advantage.

High-density polythene has the same chemical resistance and insulating properties as the low-density type, and gives coatings which, though not as smooth and glossy as those obtained with low-density material, have greater mechanical strength and rigidity, suitable for industrial applications. It has been used for the protective coating of such articles as machine-guards and cable-trunking. It has a higher softening point than low-density polythene and the coatings can be exposed to boiling water for short periods. Although this also means that the pre-heating temperature for articles to be coated is higher, there is, in fact, considerable latitude in the choice of temperature.

Coherent coatings can be obtained by dipping at temperatures only a few

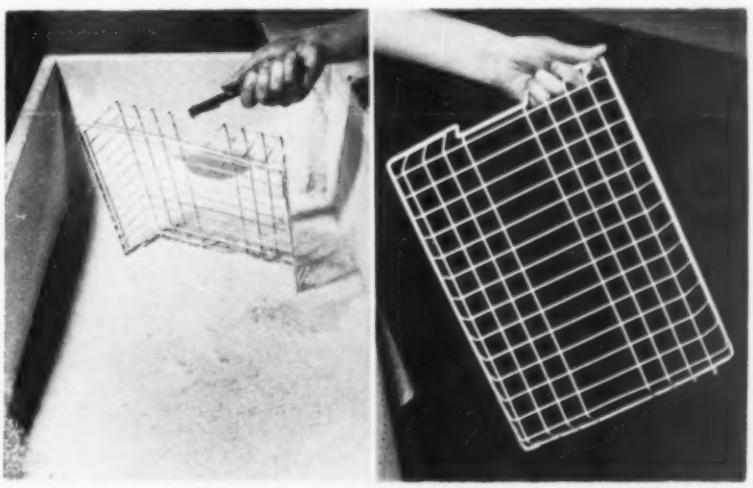


Fig. 3. (*left*) **An article at the moment of dipping into a correctly fluidized powder.** (*right*) **The finished article coated in polythene**

degrees higher than those used for low-density polythene, while on the other hand articles can be dipped at 300°C. without scorching the powder. As already pointed out, high density polythene powder fluidizes more readily than the low-density type, and the adjustment of the air-flow and speed of agitation in the fluidizing unit is not so critical. High-density polythene powder is available in colours, but it is not primarily intended as a decorative coating.

On the other hand, cellulose acetate-butyrate (cab) powder gives a high-gloss mirror-finish which can be highly decorative. In this respect it is superior to low-density polythene and in addition it has better weather resistance, suffering no deterioration, for instance, when exposed to strong sunlight. It is thus specially suitable for coating garden furniture made from tubular metal, and for the protection of constructions in wrought iron. It is also used for the coating of door-handles, hand-rails, etc. The coating has high impact strength and abrasion resistance. The powder fluidizes easily, but the air flow must be carefully adjusted, as it contains a proportion of fine-grain material which flies off as a dust cloud if the air velocity is too great.

Single Operation

The preheating temperature for articles to be dipped is considerably higher than that for polythene coating, being in the 280°-320°C. region, and the material has the disadvantage of being somewhat unstable chemically at these temperatures. Degradation of the polymer can result in crazing and embrittlement of the finish. The usual technique employed in coating with cab is to heat the article to a temperature at which the metal will pick up powder and fuse it to a smooth coating in one operation, obviating the fusion or post-heating stage altogether, and to plunge the coated article into warmed water about 5sec. after the coating has become completely smooth.

Hot-dipping in pvc pastes (plastisols) has been practised for some years, and is widely, and highly successfully, employed for the coating of very large objects. Some notable work of this type is being done by Plastics Coatings Ltd.

PVC powder however is a new development which comes into its own by virtue of the ease of formulation of both hard and soft coatings. Plastisols, which by their very nature must contain a high proportion of plasticizer, give only soft coatings. The application of pvc powder has all the advantages usually associated with fluidized-bed coating, including very low material wastage, easy and effective recovery of surplus raw material from work-pieces, and freedom from drips. With pvc there is however the problem of instability, which is rather more serious than with cab. Much closer control of pre-heating temperature is required, as, especially in the case of the harder types, the flow range is narrow, and usually in the region of the decomposition temperature. It is not easy to coat articles which show variations in thermal capacity, such as, for example, an object constructed from widely differing gauges of wire. Nevertheless, considerable progress is being made with the formulation of suitable compounds and it can be said that pvc powder coating shows great promise for the future. A particular advantage of the pvc finish is that it is unaffected by mineral oils, and is therefore particularly suitable for articles in the vicinity of machinery.

The toughness and hardness of nylon make it especially suitable for coating heavy-duty articles such as bearings, handwheels, etc. Its high cost is naturally a disadvantage, but its special properties of durability and comparatively high thermal resistance frequently justify its use. For pre-heating, temperatures up to 400°C. can be used, but it is better to achieve a desired thickness of coating by longer immersion in the powder and an initial temperature below the maximum if possible. Post-fusion is usually unnecessary. Surface gloss begins to appear on the coated article a few seconds after removal from the dipping unit, and when this is uniform the article is plunged into water, where it should be allowed to remain for some time, in order that the nylon can take up its natural content of absorbed water. Post-fusion, should it after all prove necessary, should be carried out at the same temperature as pre-heating, and for as short a time as possible.

The materials mentioned hitherto are all thermoplastics, and it is only comparatively recently that thermosetting materials, in this case epoxy resins, have entered the powder dip-coating field. The normal epoxy coating resins are either viscous liquids or solids, which must be applied in solvents. It is possible to produce an epoxy dip-coating powder by blending the two components with a suitable solid-curing agent, all in powder form. Although this has been tried with some success, there are difficulties in obtaining a sufficiently intimate blending of the powdered components, and the choice of solid curing agents is small.

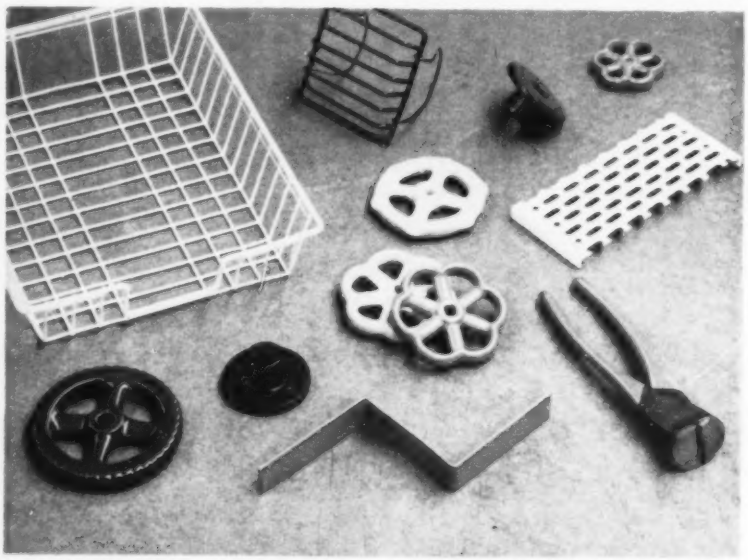


Fig. 4. The large tray and the soap dish are coated with polythene, the section of cable trunking (*on the right*) **with high-density polythene, the handwheels with cab and the other articles with pvc**

Epoxy Powder

Epoxy powder is now produced as a 'B' stage form of resin, having a cure-rate which is very slow at room temperatures, and hence a reasonable shelf-life, of about three months. The curing of the resin recommences as the powder melts on coming into contact with a hot metal article. In contrast to the thermoplastics materials, epoxy powders require a fairly long period of heating after dipping, the purpose of this being not only to fuse the powder into a smooth coating, but

to complete the cure of the resin. This period can vary from half an hour to two hours, depending on the flow-control agent used and the properties required in the finished coating.

Epoxy coatings, which are now being marketed by Telcon, show excellent electrical resistance, and thermal stability much superior to that of thermoplastics coatings. These special qualities are finding them some important applications in the electrical and electronics industries. One very interesting use for epoxy coating is the insulation of stators and rotors for electric motors. On a rotor a high degree of insulation is necessary in order that the enamelled wire used for winding should be electrically isolated from the body of the rotor. The usual procedure is to insert into each slot of the rotor an insulating liner of impregnated fibre or paper. Mechanical winding does not always proceed smoothly because of the danger of individual wires slipping between the liner and the body, or of the liner itself becoming displaced. Epoxy coating constitutes an effective replacement for the slot-liner, and enables mechanical winding to be carried out with much greater efficiency.

It is obvious from the foregoing that considerable advances are being made on the materials side of the powder dip-coating. A great deal of work has also been done on the process itself, mainly with a view to greater mechanization and the minimizing of the human element.

Attempts have been made to mechanize the actual dipping process by arranging that the articles to be coated should be carried by the conveyor directly from the pre-heating oven into the powder tank, and while immersed, agitated by mechanical means. This has proved fairly successful if the articles are simple in shape, but with more complex objects it is found that agitation by hand in the powder is the best method of ensuring good coverage.

Large Scale Plant

An excellent example of large-scale dip-coating equipment is a plant designed by Lionel Hook and Sons Ltd. and installed at the Birmingham works of Guest, Keen and Nettlefolds (Midlands) Ltd. for coating hooks of various types with polythene (Fig. 5).

The pre-heating oven has a variable-speed chain conveyor. The fluidizing tank, a Telcon Dipkota, is fitted with a conveyor and flight bars for immersing into the powder for a predetermined time, and to such a depth that the screwed portions of the hooks are left uncoated. After dipping, the hooks pass through a device for the removal and collection of excess powder, and thence into the curing oven. The electrical controls for heating and fluidization are all housed in a central unit.

This plant, which brings powder-dip-coating to the point of complete mechanization, is without doubt a forerunner of general purpose units which will handle articles of greater size and complexity with equal ease. Such equipment, and an ever-increasing range of materials, will make dip-coating in plastics powders a more and more attractive process to manufacturers of metal work and to finishers generally.

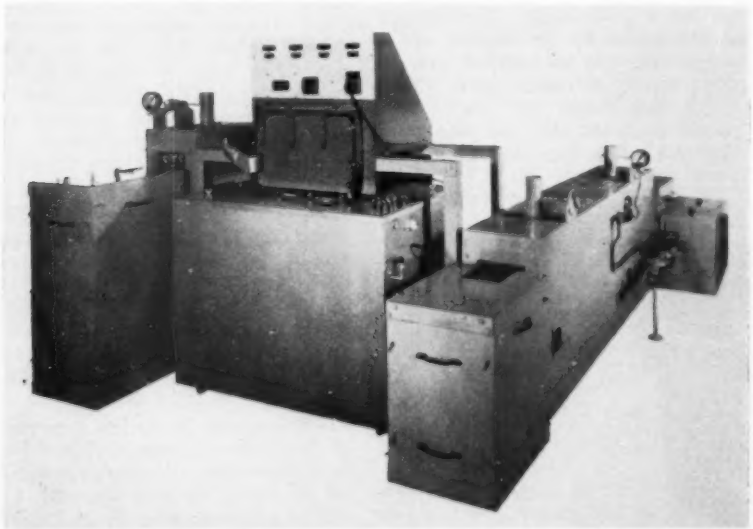


Fig. 5. Large-scale dip-coating equipment designed by Lionel Hook and Sons Ltd. for Guest Keen and Nettlefolds. The pre-heating oven has a variable-speed chain conveyor

ORGANOTIN STABILIZERS

Continued from page 670

in a report produced by the Plastics Research Institute TNO in Delft. It is quite impossible to deal logically with such a situation. It is, however, clearly a hindrance to progress when manufacturers have to adopt different formulations for each European country and processors must listen with some impatience to the effusions of politicians on the subject of EFTA or the European Common Market.

Powder Dispersions

A minor practical objection to the use of the liquid organotin stabilizers in unplasticized formulations has recently been overcome by the introduction of powder dispersions of the organotins. These powder dispersions are made in such a way that the organotin stabilizer is effectively dispersed throughout the polymer even in a simple sigma-blade or ribbon blender. These dispersions are of considerable interest to the small processor who can otherwise obtain an economic dispersion of the organotin stabilizer in an unplasticized polymer only by the use of a relatively expensive high-speed mixer.

Japanese Production

One of the most remarkable developments in the stabilizer field has been the astonishing growth of stabilizer production in Japan, which is now reliably reported to have reached about 1,000 tons per annum. This is enough to stabilize more than half the pvc production of the United Kingdom. The two most popular stabilizers in Japan seem to be dibutyltin dilaurate and poly(dibutyltin maleate), both of which are regarded as somewhat out of date in Europe. The considerable volume of research that is being undertaken in Japan will undoubtedly lead to the large scale production of more efficient types in the future.

The Japanese have worked out an entirely new route to the synthesis of di- and tri-octyltin compounds, using the direct alkylation of tin by means of butyl iodide. In the future we may well see vigorous competition between the Japanese direct alkylation process, the Grignard process, which is currently used by all the major European producers, and the new process for the alkylation of tin by means of aluminium alkyls. Whatever the outcome of this competition, there is likely to be some reduction in the cost of organotin stabilizers, with a consequent strengthening of their competitive position.

PLASTICS MACHINERY DEVELOPMENTS

Vacuum-Forming Machines

DANIELS MACHINE HANDLES THICK SHEETS

By JOHN SHEARING

T. H. AND J. DANIELS LTD. of Stroud, manufactures two types of standard vacuum-forming machines. The first is the Daniels/Latymer 30/30 Type 2 machine and the second is the Daniels/Latymer 40/30 machine.

In many ways the machines are similar but the former is capable of handling much heavier sheets. In this connexion the maximum thickness which it can handle is 0.180in., a very thick section for a vacuum-forming machine, and the maximum sheet size is 30in. x 30in. with a minimum of 12in. x 12in.

The 40/30 machine is a lighter version than the previous model and is intended for vacuum covering and forming thermoplastic sheets up to 0.060in. thick. However, larger sheets can be accommodated up to 40in. by 30in. maximum with a minimum of 20in. x 15in.

The 30/30 Type 2 Machine

This is a very versatile and fine-looking machine with all the controls situated at the front. An important feature with a machine of this type with moving equipment is that it is fully guarded. The front guard can only be removed to allow the operator access to the forming area. When the machine is on automatic cycle, no movement of the machine other than that of the heater is possible with the guard open. Even in the case of the heater, careful provision is made so that the operator cannot casually start this without due thought. This is achieved by the use of two widely-spaced buttons which must be pressed simultaneously.

The machine is equipped for drape forming, plug assistance and bubble pre-stretching and can handle thermoplastic sheet by any of these methods. The machine is air operated and in its fully-equipped form is fitted with a 2,250lb. drape cylinder and a 1,000lb. plug cylinder, although larger cylinders can be provided to special order.

Heater Control

The drape stroke is 12in. and the plug stroke is 30in. The clamp is power operated and has a maximum stroke of 14in. The standard heater has a capacity of 9kW. but a 15kW. heater is available if required. The heater in this model is divided into three independently adjustable sections and is operated by a 2in. diameter air cylinder with a hand-control provided to adjust the height.

Rotary Pump

A rotary type vacuum pump is fitted to the machine complete with reservoir and a 1½hp motor and starter. The idea of a reservoir is, of course, of the greatest importance for rapid operation since the provision of a large enough pump without reservoir would be virtually prohibitive on a price basis. Compressed air is required for the machine and a compressor and air receiver can be fitted as an additional extra. This has a 3hp motor and starter. It should be noted that the plug form unit and bubble forming chamber are additional extras.

If desired, all the movement can be controlled by hand or, alternatively, the complete cycle of operations may be preset, using the five timers mounted on the front panel. Speed and pressure controls are also provided for plug and drape movements and bubble pre-stretching.

The Daniels 40/30 Vacuum - Forming Machine is intended for vacuum - forming and covering with sheets up to 0.060in. thick

The 40/30 Machine

This machine has many of the features of the one already described except that it is lighter, for thinner sheets. However, as the clamp mechanism is hand operated, and no power-operated plug is fitted, the need for interlocked guards is avoided. Nevertheless, the danger of the operator being struck by the heater during its forward movement still exists. To overcome this, two widely-spaced buttons have to be pressed simultaneously to start the cycle either on the automatic basis or hand operations. In addition, a bar attached to the front of the heater is arranged so that, should the operator's hand be raised on the clamp when the heater moves forward, the bar will strike the operator and this will cause the immediate reversal of the heater movement.

Hand-Operated Clamp

The maximum consumption of the heater is 15¼kW. Switches are provided so that the effective heating area can be varied when using sheets smaller than the maximum size. The heater is normally at rest at the back of the machine and is moved forward when required by two 1¼in. diameter air cylinders. Its height is fixed at 6in. above the sheet.

The drape force is a maximum of 1,000lb. and the drape stroke 12in. The clamp is hand-operated and hinged at the back and counter-balance weights are fitted to reduce the effort required. The clamp force is varied by the thickness of the sheet and is initially 1,000lb. increasing to a maximum of 2,000lb. when clamping $\frac{1}{16}$in. thick sheet.

The vacuum pump has a capacity of 36 cu. ft. per min. and is driven by a 2hp motor. A vacuum reservoir of 4½ cu. ft. is also provided. A supply of compressed air at 80psi is required to operate the machine but one can be built in where no supply of compressed air is available.

Plastics Statistics

AUGUST EXPORTS AND IMPORTS

PLASTICS materials exports showed a very slight increase over the figures for the same month last year: 13,400 tons compared with 12,332, although the value fell by £179,504 from £3,043,610 in 1960 to £2,864,106. These figures are given in the official Trade and Navigation accounts, which show that the largest quantity was exported to Sweden (1,149 tons), followed by Hong Kong (752) and New Zealand (719).

Imports were lower by a little under 2,000 tons: 6,524 (£2,156,552) compared with 8,812 (£2,783,542) in August 1960. USA and Western Germany remain the largest suppliers with 1,745 and 1,204 tons respectively.

During the first eight months of this year imports were 52,960 tons (£18,445,674); for the corresponding period last year they were 66,833 tons (£20,218,379). Exports were 130,984 tons (£28,609,071) compared with 114,612 tons (£29,157,104) in 1960.

Details of imports of plastics materials during August 1961:

	Tons	£
Acrylics	344	97,958
Alkyd solid and liquid resins, solutions, emulsions and dispersions	234	52,570
Cellulose plastics:		
Acetate butyrate	105	76,981
Photographic (including cinematograph) film base (except acetate butyrate)	135	184,653
All other	132	78,781
Polyamides	413	263,847
Polystyrene	355	87,523
Polyvinyl chloride:		
Polymers and copolymers	1,527	217,236
All other	627	228,899
All other	2,650	868,104
Total	6,522	2,156,552

Exports of plastics materials during August 1961:

	Tons	£
Acrylic sheet, rod, tube, film, foil and profile shapes in primary form	454	271,921
Alkyd solid and liquid resins, solutions, emulsions and dispersions	382	77,074
Aminoplastics:		
Solid and liquid resins, including solutions	608	72,083
Moulding and extrusion compounds	542	94,129
Cellulose plastics:		
Moulding and extrusion compounds	173	60,287
Sheet, rod, tube, film (excluding regenerated cellulose), foil and profile shapes in primary form	175	102,872
Phenolics and cresylics:		
Solid and liquid resins (straight and modified)	656	125,180
Other	371	137,955
Polystyrene	1,095	225,963
Polythene (polyethylene) sheet, rod, tube, film, foil and profile shapes in primary form	256	74,587
Polyvinyl chloride:		
Polymers and copolymers	947	122,827
Moulding and extrusion compounds	566	122,475
Sheet	516	189,576
Other	50	19,895
All other	5,779	1,089,713
Waste and scrap (including celluloid and film waste and scrap)	830	77,569
Total	13,400	2,864,106

UK exports to countries in the European Economic Community (Common Market) and the European Free Trade Association are shown below.

EXPORTS TO EEC

	Aug. 1960	Aug. 1961
Western Germany	621	432
Netherlands	404	551
Belgium	443	359
France	366	362
Italy	601	303
	2,435	2,007

Exports to Commonwealth countries during the month were 3,918 tons (4,761 in August 1960) and exports to all other foreign countries were 4,476 tons (3,197 tons).

EXPORTS TO EFTA

	Aug. 1960	Aug. 1961
Sweden	502	1,149
Norway	318	450
Denmark	387	618
Switzerland	267	235
Portugal	266	369
Austria	99	178
	1,839	2,999

(Any apparent discrepancies are due to rounding off of figures)

CORRESPONDENCE

Plasticizers for PVC

Dear Sir,

I would like to congratulate Mr W. S. Penn on his series of articles on Commercial Plasticizers (*RPW*, September 11-October 9 1961). This admirable exposition will be of outstanding use to all concerned with the compounding of polyvinyl chloride polymers.

I would, however, draw Mr Penn's attention to certain inaccuracies which occur in the October 2 issue, *i.e.* No. 4 in the series. Mr Penn lists the various suppliers of plasticizers and the trade names under which they are marketed. In this list the Ravolen range of petroleum aromatic secondary plasticizers are attributed to a company named 'Petromar Ltd'. I beg to inform Mr Penn that the Ravolens are, in fact, manufactured by Manchester Oil Refinery Ltd. and marketed by Manchester Oil Refinery (Sales) Ltd.

The Ravolens form an extremely useful range of secondary plasticizers, possessing high compatibility with all types of primary plasticizers; I say specifically plasticizers since Ravolens are fully compatible with all grades of polymers available, *i.e.*, in semi-rigid goods functioning efficiently as the sole plasticizer content.

Any incompatibility characteristics occur between the primary ester and Ravolen, the actual compatibility limit being determined by the polarity of the ester and varying from 1:1 ratio with phosphate esters to 9:1 with sebacate esters.

Yours faithfully,

B. PATTON,
Chemicals Products Division,
Manchester Oil Refinery (Sales) Ltd.

Another Tough Plastics Expansion

In order to meet increased demand for its Tufplas fabrications and to reduce delivery times from the present average 12 weeks to a maximum of six weeks, Tough Plastics Ltd. has acquired further production space.

The new factory at Culcheth, near Risley, Lancashire, will give a useable floor area seven times greater than that now in use at the Weybridge factory — and it is already in limited production.

Rubber Markets

As this special export number went to press a day earlier than usual, no rubber markets are printed. Prices will be quoted as usual in next week's issue.

Plantation Newsletter

HARDBOARD FROM OLD RUBBER TREES

FROM KUALA LUMPUR

IT is encouraging to hear that Japanese businessmen are considering the possibility of investing in the manufacture of a Malayan hardboard to be produced from rubber trees. This could replace Malaya's quite large imports of hardboard and at the same time perhaps find a very profitable outlet for old rubber trees.

For years, millions of rubber trees have been deemed as useless once their tapping life has ended. They are not much good for anything, even firewood.

However, any impression that the use of rubber wood as the basis of a hardboard is a new idea on which the Japanese scientists are experimenting for the first time should be corrected from the outset. An immense amount of original research on the utilization of Malayan timbers for making hardboard has been carried out at the Forest Research Institute in Malaya, and rubber hardboard has already been made and put through a series of tests.

The Forest Research Institute's work has been badly neglected in many ways. It has pioneered all sorts of uses for timber which have only to be taken up by enterprising investors to make a lot of money and to play an important part in national development.

The Malayan hardboard, in particular, has been awaiting sponsors for some time, which is surprising in view of the almost unlimited demand for cheap housing.

As the *Straits Times* commented: 'That Japanese businessmen should appear to be the first to take advantage of this purely Malayan work offers its own comment on our own business and manufacturing community'.

Final Payment

Meanwhile the Malayan Government has started paying out the fourth, and final instalment of the M$33m. due to rubber estates. This amount from the Rubber Anti-Inflationary Cess Fund was collected from estates in the form of a cess when the rubber price was above M$1 a lb.

Repayment to producers started last December with the first instalment of M$8,250,000. Already M$24,750,000 has been paid out to 2,300 estates. This final instalment is already going out and it is expected to be completed by the end of October.

The Federation Government collected M$55m. when the price of rubber was above the M$1 a lb. mark. Of this, M$22m. was credited to the replanting fund of the Rubber Industry (Replanting) Board for smallholders. The board was presented with a single cheque for this amount.

In accordance with the Rubber Anti-Inflationary Cess Ordinance, repayments to estates should be made in four equal quarterly payments.

Speaking in Penang, Heah Joo Seang, president of the Penang Rubber Trade Association, has warned that the 'honeymoon period' in rubber trading is over. He said they must now brace themselves to meet the challenge of synthetic.

by our
Malayan Correspondent

The salvation of the rubber industry, said Mr Heah, lay in the replacement of obsolete trees by replanting with rubber clones capable of producing up to 3,000lb. an acre a year.

Mr Heah said he was very much in favour of the formation of the International Natural Rubber Association where all resources could be pooled to help build up goodwill with overseas consumers.

'The construction of rubber roads has been carried on at a snail's pace, but I am now very encouraged to read that more rubber roads are to be built in Malaya', he added.

Dunlop Malaya

The small investor has received first priority in the allotment of 4,680,000 $1 shares by Dunlop Malayan Industries Ltd. The object has been to give the widest possible spread.

This issue attracted nearly 6,000 valid applications, the company announced. Just over M$17,500,000 was subscribed. The applications ranged from 500 shares (the minimum) to 500,000 shares and these included 175 preferential applications by members of the staff and Dunlop dealers.

The following basis of allotment was decided for ordinary applications: Up to 2,000 shares (500 allotted); 2,500 to 5,000 (1,000); 5,500 to 10,000 (1,500); 10,500 to 20,000 (2,500); 20,500 to 100,000 (6,500); and 100,500 to 500,000 (15,000).

Preferential applications: Up to 2,000 shares (in full); 2,500 to 5,000 (2,500); 5,500 to 10,000 (4,000); 10,500 to 25,000 (7,000); 25,500 to 100,000 (12,500).

Letters of allotment and cheques for surplus cash have now been posted to applicants.

Petaling Jaya

The Dunlop Rubber Co Ltd. has already subscribed in cash for 7,270,000 shares in the new company which will manufacture motor vehicle tyres and tubes at a M$17m. factory in Petaling Jaya.

The company is expected to be profit-making by 1964 and thereafter the directors intend to follow a progressive dividend policy.

Rubber Statistics

WORLD POSITION JUNE 1961

THE following preliminary information on the world rubber situation is given by the Secretariat of the International Rubber Study Group (in long tons):

NATURAL RUBBER

	June	Jan./June	July
Production	155,000	970,000	—
Deliveries from stockpiles[1] ..	4,000	14,000	3,000
Consumption[2] ..	177,500	1,010,000	160,000

STOCKS, END PERIOD

	June	July
In producing areas ..	265,000	280,000
In consuming areas ..	217,500	215,000
Afloat	187,500	—
Total	670,000	

[1]Deliveries from the Government stockpiles of the United States of America and the United Kingdom.

[2]Including estimated imports into the USSR and China as follows: USSR, June, 33,750; January/June, 159,500; July, 25,250; China, June, 3,000; January/June, 32,000; July, 2,000.

SYNTHETIC RUBBER

	June	Jan./June	July
Production ..	147,500	907,500	152,500
Consumption	162,500	907,500	142,500

STOCKS, END PERIOD

June	July
355,000	370,000

Reported exports of rubber from Indonesia during June 1961 amounted to 40,616 long tons of which 14,002 long tons were of estate origin.

West Germany

West German rubber tyre production picked up again during August, according to the Federal Bureau of Statistics.

It totalled 19,352 tons (provisional) compared with 18,932 tons (revised) in July and 19,193 tons in August of last year. Production in the first eight months of this year amounted to 156,271 tons (provisional) against 151,554 tons in the corresponding period of last year.

Output of other hard and soft rubber goods during August was 22,758 tons (provisional) against 20,122 tons (revised) in July and 23,037 tons in August of last year. In the first eight months of this year it amounted to 186,091 tons (provisional) against 186,421 tons in the corresponding period of last year.

Imports of natural rubber and rubber sole crepe during July totalled 8,397 tons (provisional), including 4,854 tons from Malaya.

Imports of synthetic in July totalled 4,027 tons (provisional) including 1,966 tons from the USA and 829 tons from Canada.

Industry INTELLIGENCE

Technical Data

Supra Scarlet Chrome YS

Supra Chrome YS powder is a new molybdated lead chrome pigment recently introduced by the Dyestuffs Division of Imperial Chemical Industries Ltd. One of its main applications is expected to be in full-shade industrial finishes with good hiding power and weathering resistance, suitable for heavy transport applications and as paints for metal signs. Supra Scarlet Chrome YS is claimed to have high opacity, soft texture, good heat and light resistance and insolubility in organic solvents of the chrome pigments. These properties make the new pigment of value where high fastness to both light and solvents is required, as in finishes for petrol tankers and oil pumps.

It is also suitable for the coloration of plastics, showing no tendency to migrate.

Polythene Coatings

A new Tenite polythene formulation which produces glossy coatings having a low coefficient of friction is now available from Eastman Chemical Products Inc., 260 Madison Avenue, N.Y.16.

The new formulation, designated Tenite Polythene 1H55P Natural, contains a special slip additive capable of withstanding the high melt temperature required in extrusion coating.

The formulation is said to have other superior extrusion-coating properties, including uniform drawdown, low neck-in, low edge variation, and good adhesion. It has a nominal melt index of 3.5 and a nominal density of 0.921. In laboratory tests, the minimum sealing temperature of one-mil coatings on 40lb. kraft paper was approximately 300°F. The high slip afforded by 1H55P is especially advantageous for coated paper that is to be fabricated into glossy cartons and pouches on high-speed packaging machinery.

High Purity Metals

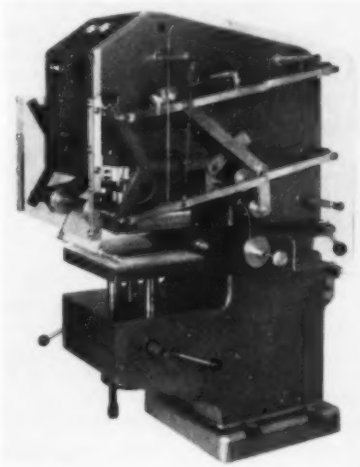
The latest series of data sheets issued by Johnson, Matthey and Co. Ltd. covers its range of high purity metals. In recent years, the advance of technical developments in many fields has brought about a demand for a wider variety of high purity metals and a greater diversity of physical forms. Johnson Matthey has produced a range of high purity metals and techniques for fabricating many of them into rod, sheet and other forms.

In the data sheets, information is given on 38 metals. The general properties of each element are tabulated and details are given of the forms of current production. In most cases the metals are available in more than one grade, the metallic impurity contents being expressed in parts per million. The sheets are available on request to the company's head office at 73-83 Hatton Garden, London, E.C.1.

Machines, Materials and Equipment

Hot Press Marking Machine

Phillips Bros. and Ellis Ltd., 11/13 Charterhouse Buildings, Junction of Goswell Road and Clerkenwell Road, E.C.1, has introduced a heavy duty machine to be added to their range of



hot press marking machines. Called Model T-5, it is semi-automatic and has a positive marking area of 12in. x 10in.

Incorporated in the T-5 are the design features of the company's Universal range of dry printing machines — the pressure, dwell-time and temperature are pre-set and accurately controlled. There is a large vertical head movement in order to allow the operator unobstructed sight of the work to facilitate feeding, and to prevent pre-heating of the foil.

Dustless Powder Unloading

Modern powder handling techniques need dustless conveying. A system devised by Bivac Air Co. Ltd., Marshland Street, Stockport, is claimed to give rapid handling — from 5cwt. to 12 tons per hour — of fine chemicals in the micron or sub-micron range.

There are two types of conveying systems available. The first uses the services of an operator to draw out by suction, through a flexible hose, a quantity of powdered material, which then enters a cyclone for air powder separation. The product is then unloaded through a rotary valve into a hopper or mixer. The airborne particles are separated out by a filter situated above the cyclone separator. The necessary suction is created by a turbo exhauster.

In the second type of plant the powder to be conveyed is dropped from a storage hopper through a rotary or similar valve into the pipeline through which a high speed stream of air passes, conveying the material to combined filters and storage hoppers. In these units the conveyed material is separated out and dropped by gravity into a further process or storage hopper. The necessary suction is again provided by a suitable exhauster.

Publications

Nonox B

The Dyestuffs Division of Imperial Chemical Industries Ltd. has issued No. 1 of a series on rubber chemicals literature. The first issue deals with Nonox B.

This belongs to the wide range of chemical products made by condensing a ketone and an amine under suitable conditions and has valuable properties as a general-purpose antioxidant. Nonox B is a resinous product with a melting point between 75 and 90°C. It is available as a fine powder which disperses in rubber at the usual processing temperatures. Alternatively, it is available as small, free-flowing, dustless, resinous rods. If adequate dispersion of the rods is to be obtained, the processing temperature must be sufficiently high to cause softening. In general terms, a minimum mixing temperature of 70°C. is necessary, but this can vary depending on the composition of the rubber mix. Nonox B Powder and Nonox B Rods are chemically identical and interchangeable. The effect of Nonox B in mixes of different types is discussed.

Plasticized PVC Film

British Cellophane Ltd., Henrietta House, 9 Henrietta Place, W.1, has issued a booklet on plasticized pvc film. There are two grades of BCL plasticized pvc film, soft and semi-rigid. The soft has good insulating properties — it is said to be suitable for lamination, for skin-packaging, for overwrapping and for various industrial purposes. The semi-rigid film is stiffer, reasonably tough, and its main use is for vacuum-forming and blister-packaging.

The physical properties of the film are described below, and are followed by a chart giving a numerical comparison with low density polythene film.

RUBBER and PLASTICS in the COMMON MARKET

Continued from page 619

petition of the newer thermoplastics, particularly polystyrene, although more recently there have been signs of a revival. In the future, consumption in the main outlets for thermosets — paint manufacture, textile finishes, coatings, adhesives and laminates — is expected to continue to grow only at a steady rate and entry into the Common Market will make no significant difference to the balance of Britain's trade in these materials.

In short, therefore, as far as the rubber and plastics industries as a whole are concerned, far and away the most important result of Britain's entry into the Common Market will be the stimulus it should give to total demand and with it the demand for the products of these industries. Trade in the raw materials which they use will be affected little, with the possible exception of pvc, and much the same is true of trade in their finished products.

Malayan Merger

Tunku Abdul Rahman, the Malayan Prime Minister, said on Monday (October 16) that Britain had welcomed the idea of merging Malaya, Singapore and the British Borneo territories. He would visit London on November 7 to discuss this 'Malaysia' proposal.

The Tunku added that the British Government had agreed that the best future for the Borneo territories (North Borneo), Brunei and Sarawak, lay in close political association with the Federation of Singapore.

Future Events

Institution of the Rubber Industry

Humberside Section. — October 26 at the Yarborough Hotel, New Holland, at 7.45 p.m. 'Recent Developments in Chlorinated Butyl Technology', by P. E. Davies, ANCRT, AIRI (Esso Petroleum Co. Ltd.).

Leicester Section. — October 27 at the Grand Hotel, Leicester, at 7 p.m. 'Market Research' by M. I. Moroney (Unilever Ltd.).

Manchester Section. — October 23 at the Engineer's Club, Albert Square, Manchester, at 6.45 p.m. 'Variability in Synthetic Rubber Supplies', by C. I. A. Heal (Dunlop Rubber Co. Ltd.).

Plastics Institute

Midlands Section. — October 24. Visit to the Research and Development Laboratories, Distillers Plastics Group, Sully, Glamorgan. — October 27, at the James Watt Memorial Institute, Gt. Charles Street, Birmingham 3, at 7 p.m. 'Economics' by F. Boydon (Guy Motors Ltd.).

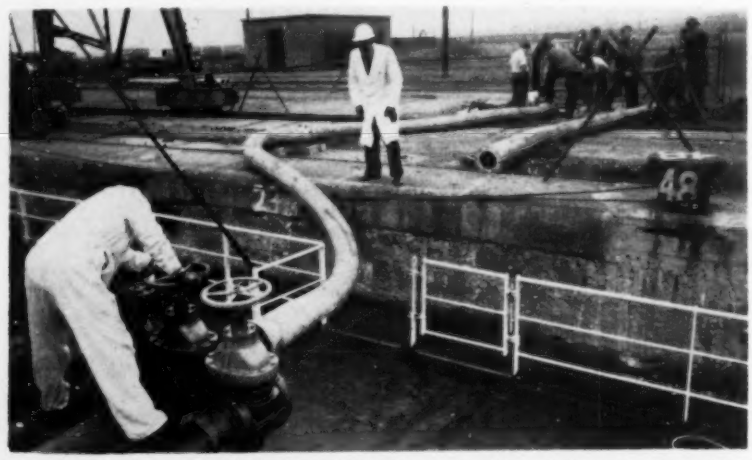
Leicester Dinner-Dance

The annual dinner-dance of the Leicester section of the Institution of the Rubber Industry will be held on Tuesday November 14 1961, at King's Hall, Grand Hotel, Leicester.

Tickets — 32s. 6d. single, £3 double — can be obtained from J. Devlin, B.B. Chemical Co. Ltd., Ulverscroft Road, Leicester.

Buying Plastics Packages

Following the success of the first course for buyers of packaging a repeat is to be held at the Connaught rooms, London, on November 28-29 1961. Papers will include one on buying packages in plastics by Dr G. Swift (Metal Box).



The first consignment of ethylene dichloride to be shipped direct to the British Geon Ltd. factory at Barry, Glamorgan, is unloaded at Barry docks. This consignment, shipped by tanker from the Grangemouth plant of British Hydrocarbon Chemicals Ltd., marks the start of production at British Geon's latest extension to its pvc-manufacturing plant

Export Opportunities

Plastics Machinery for Germany

Herr Heinz Herrmann, Berlin-Lankwitz, Siemenstrasse, 45a, wishes to represent British manufacturers of the following: plastics injection moulding machines and presses, drying and pre-heating equipment for the plastics industry, and granulates for the plastics industries.

Manufacturers should write direct to him, at the same time informing the Commercial Section, British Consulate-General, Charlottenburg 2, Uhlandstrasse 7-8, Berlin, that they have done so.

Calls for Tenders

Tyres and Tubes

Tyres and tubes with flap highway tread are required by the Central Trust of China, Purchasing Department, 68 Yen Ping Nan Road, Taipel, Taiwan, to whom bids should be sent. Job No. GFB-10821 must be quoted in correspondence.

Closing date: October 26 1961 (Ref. ESB/31663/61).

NEW COMPANIES

C. and F. Plastics Ltd. (700,683). August 11. Capital: £1,000 in £1 shares. The first directors are to be appointed by the subscribers.

Trackvil Ltd. (700,372). August 9. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, tyres, etc. The first directors are to be appointed by the subscribers.

Plastic Plumbing Specialities Ltd. (700,256). August 8. Capital: £1,000 in £1 shares. The directors are: Alfred R. Hoare, and Anthony R. Hoare, both of 26 Haling Park Road, S. Croydon, Surrey; Edward B. Hart, 37 Buckingham Road, Shoreham by Sea. Regd. office: 40 Portland Place, W.1.

Corolite Ltd. (700,315). August 8. Capital: £100 in £1 shares. To carry on the business of merchants of, and dealers in, plastics and plastic compounds to the building, engineering and allied trades, etc. The directors are to be appointed by the subscribers.

Tyreways (Walsall) Ltd. (699,965). August 2. Capital: £10,000 in £1 shares. To acquire the business of a tyre distributor carried on by T. S. Downes at Sutton Road, Walsall, as 'Three Crowns Tyre Service,' etc. The directors are: Thomas S. Downes, 103 Longwood Road, Barr Common, Walsall; Charles I. P. Tidman, 114 Longwood Road, Barr Common, Walsall. Regd. office: Littleton Street West, Walsall.

Increases of Capital

Carlton Plastics Ltd. (679,530), Parkstone Works, Wingletye Lane, Hornchurch. Increased on December 19 1960, by £100 in £1 ordinary shares, beyond the registered capital of £100.

County Tyre Service (Wales) Ltd. (409,376), 23-25 Nelson Parade, Bristol, 3. Increased on December 15 1960, by £7,500 in £1 ordinary shares, beyond the registered capital of £7,500.

Larkhill Rubber Co. Ltd. (645,158), 40 High Street, Street, Somerset. Increased on December 28 1960, by £124,900 in £1 ordinary shares, beyond the registered capital of £100.

Changes of Name

McGrath Plastics Ltd. (612,286), Trading Estate, Cheney Manor, Swindon. Name changed to L. I. Plastics Ltd. on February 22 1961.

Essex Plastics Co. Ltd. (679,336), 9 Harley Street, W.1. Name changed to Essex Plastics Company Ltd. on February 27 1961.

GOODYEAR
Unseen
but
important
Just as an important part of an iceberg goes unseen, so does an important part of Goodyear work – a vast amount of patient research. Far and away the world's largest producer of rubber products, Goodyear puts more effort into research than any other rubber company. Unequalled research leads to unequalled product quality – one important reason why Goodyear has led the world's rubber industry for more than 46 years.
GOODYEAR
THE GREATEST NAME IN RUBBER

CLASSIFIED ADVERTISEMENTS

RUBBER AND PLASTICS WEEKLY

APPOINTMENTS VACANT

8d. a word, Minimum 12/- Box 2/-

ASSISTANT Chief Chemist.—A qualified Chemist/Rubber Technologist required with knowledge of the compounding of synthetic rubbers; experience of plastics technology an advantage. The Company manufactures flexible aircraft fuel tanks, specialized rubber mouldings and a range of commercial containers. — Please write, giving details of age, education, experience, salary, etc., to Personnel Manager, Fireproof Tanks Limited, The Airport, Portsmouth. (064)

CHARGE hand required for surgical plastic department. Knowledge of extrusions advantageous.—Write stating age, experience and salary required to Box 054. (054)

FOREMAN required, fully experienced in the compounding of synthetic rubbers and should have first class knowledge of all aspects of calendering. This will be a permanent, progressive position in a rapidly expanding department and the selected applicant will be responsible to the existing Departmental Superintendent. Applicants should have held a similar supervisory position and had a number of years' experience in the above processes. — Please write, giving details of age, experience, salary, etc., Box 065. (065)

LABORATORY assistant for development team in North-West Middlesex. At least to LIRI standard. Release scheme to allow continuation of AIRI course. Interesting, varied work on new products, involving all latest polymer developments. Good salary, pension scheme, canteen facilities, etc.—Write giving details of experience, etc., to Personnel Dept., Rubberware Ltd., Bell Works, Harefield, Middlesex. (102)

LATEX foam technologist required by company in Lancashire. —Write stating age and experience to Box 104. (104)

PRECISION Rubbers Limited have a vacancy for a qualified and experienced chemist/technologist, aged 25-35, to undertake compounding and other development work in connection with synthetic rubbers. This appointment offers considerable scope and interest for a man with initiative and ability.—Apply in writing, giving particulars of age, training, qualifications and salary required to The Technical Director, Precision Rubbers Limited, Bagworth, Leicester. (052)

SPONGE production. A chemist with good experience of sponge and a technician similarly qualified are urgently required by growing company in country district. Excellent working conditions and pension arrangements.—Write with full details of career and salary required to Box 463. (463)

RONALD TRIST AND CO. LTD., Bath Road, Slough, require a draughtsman to design dies for high quality precision rubber moulding. Applicants should be skilled draughtsmen and previous experience of this type of work is essential. This is a permanent and pensionable appointment and the salary will be commensurate with qualifications and experience. A five-day week of 37½ hours is worked; subsidised canteen facilities are available and life assurance and sickness benefit schemes are in operation. Applications giving all relevant details should be sent to the Personnel Officer. (103)

DOWTY SEALS LIMITED

require

RUBBER TECHNOLOGIST

for interesting development work mainly connected with synthetic rubber. Previous experience in oil seal work would be an asset. Minimum standard LIRI required.

Lodging allowance, assistance with house purchase and removal expenses available in approved cases.

Apply, giving full details, to the Personnel Manager, Dowty Seals Limited, Ashchurch, Tewkesbury, Glos. (088)

APPOINTMENTS VACANT

EAL EXECUTIVE APPOINTMENTS LIMITED
78 Wigmore Street, London, W.1

DEVELOPMENT MANAGER **Rubber and Plastics**

A long established and well known company engaged in manufacture of a wide range of rubber and plastic goods seeks a high level technologist at a salary of at least £3,000 to direct technical development. Responsibilities will embrace study of modern technology; investigation of new concepts; initiation of proposals for new products; development of prototypes; charge of laboratory; and maintenance of quality standards.

This key post in a substantial and vital organisation will be attractive to men aged 35-45; with a degree in chemistry and physics; mature experience in emulsion polymers, polyurethanes and thermo-plastics; and a history of practical contact with manufacture of tyres, belting, hose products and footwear. The successful candidate will be a first class scientific administrator with the vision to create and plan and the initiative to innovate. (RN. 115D)

Please write briefly in strictest confidence to the Managing Director, quoting the reference number. No identities divulged without permission. (092)

RUBBER chemist/technologist required by a progressive medium-sized rubber company to fill the position of chief chemist. Applications are invited from chemists with experience in compounding, process control and development. A contributory pension scheme operates. Housing assistance will be given. All applications will be treated in confidence.—Write stating age, present salary and full details to Box 101. (101)

YOUNG man required for development work in laboratory of small progressive brake lining company, location South-West England. Qualification ONC or HNC chemistry.—Box 081. (081)

APPOINTMENTS WANTED

8d. a word, Minimum 12/- Box 2/-

GRADUATE with technical education prospects, seeks year or so rubber plastics works and laboratory. Some experience both. London area.—Box 076. (076)

QUALIFIED technologist, AIRI, considerable experience moulded, extruded mechanicals, sponge, particularly automotive, seeks challenging executive appointment demanding ability and initiative. Home or abroad.—Box 108. (108)

This column can be YOUR best BUYER or SELLER

RUBBER & PLASTICS

MACHINERY

Why not see for YOURSELF

MACHINERY FOR SALE

8d. a word, Minimum 12/- Box 2/-

'COTSWOLD' dipping machines and circulating tanks for latex and PVC. New catalogues now available on request. —Lionel Hook and Sons, Ebley, Stroud, Glos. Tel.: Stonehouse 614/5. (380R)

MACHINERY FOR SALE
(continued)

A MAGNIFICENT Coventry Climax petrol forklift truck, complete with unused crane jib attachment. 3,500lbs. capacity. 12ft. lift (4,000lbs. capacity to 9ft.). Engine completely reconditioned, re-bored, new pistons and valves, new clutch fitted. New twin pneumatic tyres. Electrical system overhauled (including starter and dynamo). Hydraulic system thoroughly checked. Hydraulic steering reconditioned. Brakes overhauled. Unused crane jib (cost £78), lifts 15cwt. to 16ft. Price £795 complete. Photograph available. View by appointment only.—Speed Electrics (Dept. R. & P), Church Street, Basford, Nottingham. Tel. 75716. (095)

CONVEYANCER electric battery operated forklift truck. 2-tons capacity. 12ft. lift. Complete with battery charging unit. Solid rubber tyres. Excellent bank of batteries. In magnificent working condition. £795.—Speed Electrics (Dept. RJ), Church Street, Basford, Nottingham. Tel. 75716. (096)

DUST extractor unit by Hall and Kay. 'Miracle'. 2 fans, 5 cyclones. 18 new gas black infra red panels by De La Rue.—Box 091. (091)

JACKETED Z-bladed duplex mixer by Baker Perkins, fully jacketed, including lid. Pan 4ft. 5in. x 3ft. 8in. x 3ft. deep. Geared both ends, complete with hydraulic tipping gear. Duplex chain drive, fitted 50 h.p. flame-proof slip ring motor and starter. Recently reconditioned and bearings renewed. £1,500. —Box 078. (078)

For RE-BUILT
RUBBER PLASTIC
AND
HYDRAULIC MACHINERY
CONTACT
HODSON & Co. (MACHINERY) LTD
Spring Mills, Tottington
Nr. BURY, LANCS.
Phone: TOTtington 123 (099)

MACHINERY FOR SALE
(continued)

MANUFACTURERS of roughing machines for rubber sheeting, sponge rubber, splitting machines, leather cloth plant, embossing plates and rollers, spreading machines and presses.—G. L. Murphy Ltd., Imperial Works, Menston, Nr. Leeds. (238R)

FOR SALE
EMB PLASTIC MOULDING
MACHINE
Reavell compressor and receiver, 32.5 motor, Heater control panel.
This machine is practically unused and in excellent condition.
MICKLEBURGH MACHINE TOOLS LTD.
Arundel Road, Uxbridge, Middlesex. Tel. Uxbridge 38979 or 36799 (087)

SHAW 60in. x 22in. mill with 100 h.p. drive. 30in. x 24in. and 21in. single geared cracker with 200 h.p. drive. Pair of 50in. x 18in. single geared mills with 140 h.p. drive. Several smaller mills.—Reed Brothers (Engineering) Ltd. (Mr. C. E. M. Hardie—Receiver and Manager), Replant Works, Woolwich Industrial Estate, London, S.E.18. Tel.: Woolwich 7611 (093)

TENSILE testing machine suitable for rubber, plastics, etc., inspection in London.—Full particulars from Box 100. (100)

UNUSED 60in. x 22in. single geared mixing mill, friction ratio 1.15 to 1, Vibro mounted, Lunn safety equipment driven by 125 h.p. slip ring motor.—Box 094. (094)

Donald Leaver Limited
1 LONDON ROAD, STAINES, MIDDX. Phone STAINES 55271-2
FOR **SECONDHAND**
PLANT AND MACHINERY (1057)

PINE OIL · ROSIN · DIPENTENE · HARDWOOD PITCH

PINE TAR

for use in

RUBBER COMPOUNDING

THE WHITE SEA & BALTIC CO.
P. & I. DANISCHEWSKY LTD.

4 BROAD STREET PLACE, LONDON, E.C.2

MEMBERS OF THE RUBBER AND PLASTICS RESEARCH ASSOCIATION

Butyl | **SEALANTS LTD**

for

LAMINATES · SHEET · SPONGE · STRIP

(929)

MACHINERY WANTED

8d. a word, Minimum 12/- Box 2/-

EXTRUDER required, suitable for straining scrap PVC. Must be in good condition.—Box 107. (107)

INTERMIX, capacity either 30lb., 60lb. or 100lb.—Full details to Box 090. (090)

LABORATORY mill, about 12in. rolls.—Box 053. (053)

MELLOR Equipment Ltd., Springfield Lane, Salford, 3, buy used machinery of Francis Shaw and Joseph Robinson manufacture.—Telephone Manchester, Blackfriars 1866. (428)

12IN. x 6in laboratory mill. Must be in good condition.—Box 089. (089)

AGENCIES and REPRESENTATIVES

8d. a word, Minimum 12/- Box 2/-

AGENCIES (Continental) required for virgin and processed materials by processor who has contacts with very large companies.—Box 105. (105)

APPLICATIONS are invited for the post of technical sales representative. The products involved are basic raw materials for the rubber, plastics and allied industries.—Write giving full particulars of experience to Box 098. (098)

REPRESENTATIVES required with good industrial contacts to sell sheet and general mechanical rubbers in the following areas: 1. Notts, Derby and Leicester; 2. Potteries; 3. West of England; 4. South Wales. State age, experience and salary required. All replies in strict confidence.—Box 097. (097)

TRADE SERVICES

8d. a word, Minimum 12/- Box 2/-

SCISSORS, up to 7in. ground and set by London cutlers established over 100 years; 48 hours postal service, 1/6 per pair.—J. A. Fowler, 18/22 Bell Street, Edgware Road, London, N.W.1. PAD 1491. (74R)

COLLINSON'S

Engineers and Mould Makers

MOULDS

MADE TO THE FINEST LIMITS OF ACCURACY

17 BATH STREET, SYSTON, LEICESTERSHIRE

TEL. SYSTON3472 (882)

ADVERTISERS

YOUR ANNOUNCEMENTS MAY BE DISPLAYED IN THE CLASSIFIED SECTION AT THE FOLLOWING RATES

PER INCH SINGLE COLUMN

1 INSERTION £3. 0. 0. 7 INSERTIONS £2. 15. 0. EACH

13 INSERTIONS OR MORE £2. 10. 0. EACH

OR AS LINES AT 5s. 6d. PER LINE

ARTICLES WANTED

JOHN BULL (Bristol) requires from overseas regular quantities of PVC scrap (all grades).—Bury Factories, Wick, Bristol, England. (106)

REGULAR BUYERS **P.V.C.** **SHEET SCRAP**

MICHAEL S. STEVENS LTD

STATION WORKS, 75c UPPER RICHMOND RD., S.W.15

VANDYKE 6925 (739)

PLEASE NOTE

INSTRUCTIONS FOR THE CLASSIFIED ADVERTISEMENTS MUST REACH US BY 10 A.M. WEDNESDAY MORNING OF EACH WEEK

Address Box Number replies to:

Box No. —, RUBBER AND PLASTICS WEEKLY

Maclaren House, 131 Great Suffolk Street, London, S.E.1

The Talloil Type Rubber Plasticisers

Neo-Spangol

Neo-Spangol Extra

Neo-Spangol Liquid

Neo-Spangol T-20

Neo-Spangol RV-40

ECONOMICAL · EFFECTIVE · RELIABLE

Manufacturer:

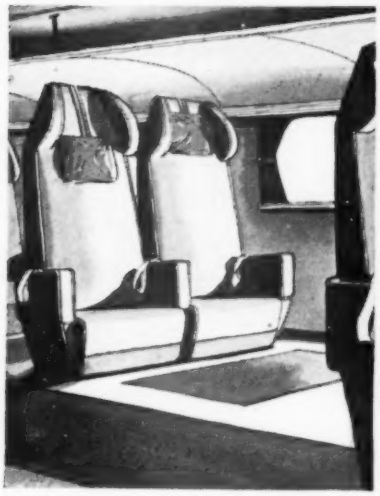
SPANGENBERG-WERKE GmbH.

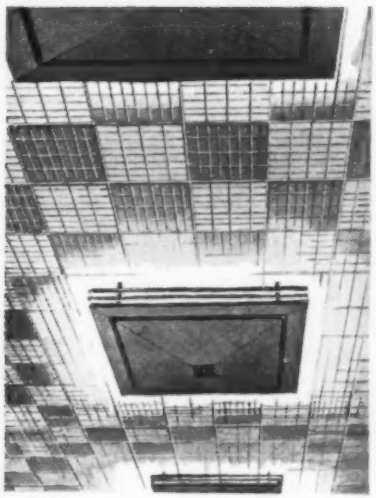
Hamburg-Eidelstedt, Germany

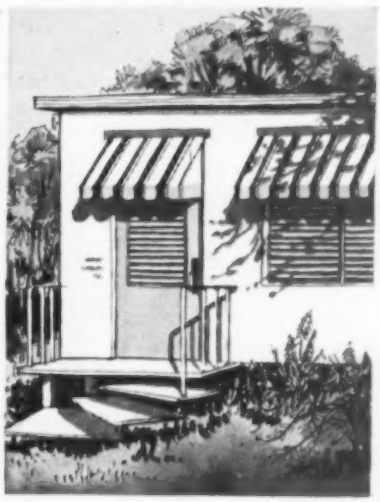
Please write for technical information and samples

Agents all over the world

EVO-STIK ADHESIVES INCREASE PLASTIKABILITY







Only one adhesive range was designed especially for plastics with the group ability to solve every plastic bonding problem.

Plastics in seats, plastics in ceilings; in bungalows and radios; and in my ladies chamber. Plastics to be fixed. Fast fixings. Strong fixings. Fixings that need bulldozers to blast them apart. Or spot fixings for a ladies purse. Now you're getting around to Evo-Stik 'Impact' Adhesives. Formulations? Dozens of them. For plastics? Especially! Special abilities? Plasticability! First in the field. Latest in progress. Laboratories? Certainly; full of chemists, scientists, back room boys. Full of new plastics problems. Your problem different, difficult? Course it is. Everyones different, difficult. Problems are profit for both of us. Get on the phone. It's by your hand.

Plasticability

another word for

'IMPACT'
EVO-STIK
ADHESIVE

Registered Trade Mark

Evode Ltd. (Industrial Adhesives Div.) Common Road, Stafford. Telephone: 2241. Telex: 3661 London Sales Office: 450/52 Edgware Road, W.2. Telephone: AMBassador 2425 Telex: 27884
Associated Company in Eire: Evode Industries Ltd., Swords, Co. Dublin Telephone: Swords 331

EV66

IOCO

RUBBER MECHANICALS AND SPONGE RUBBER

Through its close association with one of the largest engineering groups in the country, IOCO LIMITED has had great experience in the manufacture of mechanical rubber goods for general service and special applications, including :

I.R. SHEET · RUBBER and CANVAS INSERTION · ENGRAVING RUBBER SHEET MOULDINGS · EXTRUSIONS · DIAPHRAGMS, JOINTS and GASKETS · SPONGE RUBBER SHEET, STRIP and MOULDINGS RUBBER-TO-METAL BONDED MOULDINGS

ROLLER COVERING
Modern plant and a fund of technical skill enable us to undertake covering of all types of rollers.

TANK LINING and COVERING
We can manufacture the appropriate quality of rubber and line tanks and process plant for a wide variety of applications.

IOCO LIMITED ANNIESLAND · GLASGOW
ONE OF THE VICKERS GROUP OF COMPANIES

ZAMA LTD.

TRADE MARK

AMZA Ltd

RUBBER WATERPROOFERS

ALL CLASSES OF PROOFING FOR THE GARMENT, MOTOR HOOD & BAG TRADES

'FLORIN STREET,
PENDLETON, SALFORD, 6
'PHONE: PENDLETON 3008-9

LONDON OFFICE
BUSH LANE HOUSE, BUSH LANE, E.C.4
'PHONE: MANSION HOUSE 0781

MANY FACETS
OF
MODERN LIVING

BENEFIT FROM **TELCON PLASTICS**

Telcon Plastics products contribute to the development of industry, agriculture, building, transport and communications.

Telcothene Tubing · Thermoplastic Sheeting
Telcothene Coated Papers and Laminates
Thermoplastic Powders · Telcomesh Mouldings
Extruded Sections

For detailed information on any product get in touch with

TELCON PLASTICS LIMITED
A member of the BICC Group

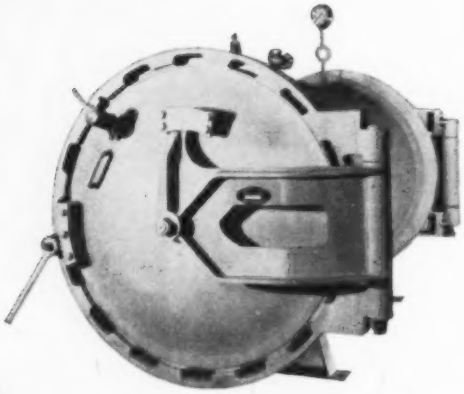
Farnborough Works, Green Street Green, Orpington, Kent
Tel: Farnborough Kent 55685

LORDS
OF BURY

Specialists in

VULCANISING PANS, AUTOCLAVES AND PRESSURE VESSELS

BOLTLESS DOORS MANUALLY OR POWER OPERATED



MANUFACTURED BY

R. LORD & SONS LIMITED

Barnbrook Boiler Works, Bury, Lancashire *Telephone: Bury 4862 (2 lines)*

Invisible money?

No! For it can be collected by recovering volatile solvents with **SORBONORIT** highly activated carbon and installations. It will lower your production costs considerably.

don't go blindfolded!

For full information please apply to

NORIT

United Norit Sales Corporation Ltd., Amsterdam-Holland

Canadian Branch Office:

P.O.Box 310, Scarborough (Ontario)

Precision | **Rubber Products (DENTON) Ltd**

General Mechanical Rubber Mouldings and Extrusions

PVC Injection Mouldings

PVC Dipped Specialities

Manufacturers of Components for Car, Motor cycle, Cycle and Allied Trades

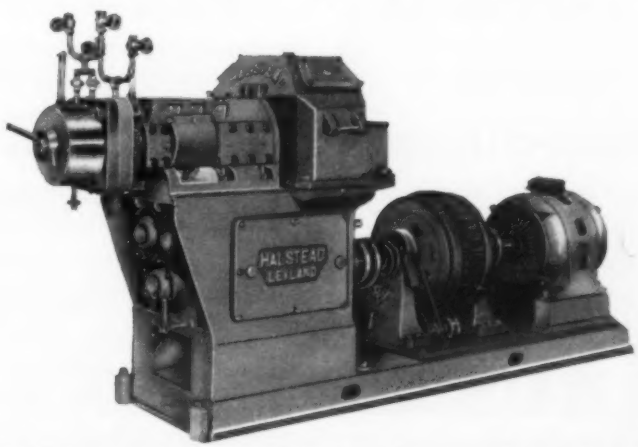
Heaton Works
Denton, Nr. Manchester

Telephone: DENton 4256-7 (2 lines)
Telegrams: Precision Denton Manchester

HALSTEADS ENGINEERS (Leyland) LTD
LEYLAND, LANCASHIRE

Telephone : Leyland 21529

Rubber and Plastic Engineers

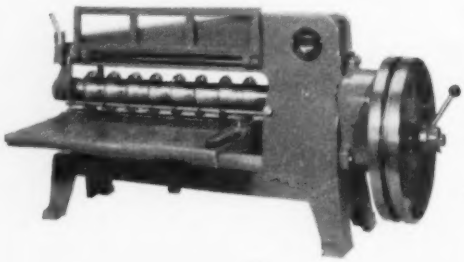


3½" rubber extruder with variable speed dynamatic coupling drive

STRIP CUTTING
MACHINES

Available in 3 sizes up to 15" working width

These **open ended** machines are ideal for cutting pliable material of every description, e.g. rubber, leather, felt, cork, linoleum, plastic, paper and celluloid, etc., into parallel strips.

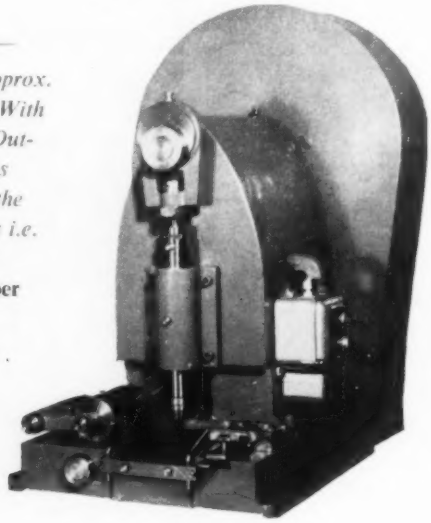


*CUTTING PRESS
WITH AUTOMATIC FEED

For the rapid production of washers, discs, gaskets, etc., from cured and uncured rubber, cork, felt, asbestos, paper and cardboard, etc.

★ **Output Rate :—**

6,000 per hour approx. @ 3½" diameter. With multiple cutters Output Rate increases proportionate to the number of cutters i.e. 3 cutter x 6,000 = **18,000 parts per hour.**



If you have a cutting problem consult:

P. W. Merkle, Ltd.

60 TABERNACLE ST., LONDON, E.C.2

Tel : Clerkenwell 6397 Grams : Idomene, Ave, London

NATURAL & SYNTHETIC LATEX COMPOUNDS

Pre-vulcanised Latex

Reclaim Dispersions

Colour Dispersions

Vulcanising Dispersions

Filler Dispersions

RL

RUBBER LATEX LIMITED

HARLING ROAD, WYTHENSHAWE, MANCHESTER 22.

Telephone: Wythenshawe 3226/7/8. Telegrams: Compounds Manchester

London Office: St. Dunstan's House, Idol Lane, E.C.3. Telephone: Mansion House 1005

RL. 57

Sponge Rubber

SHEET, STRIP, CORD, GASKETS IN ALL COVERINGS. SEALS AND SEALING RINGS OF EVERY DESCRIPTION. 'RUBBADOORS' IN NATURAL AND SYNTHETIC RUBBER. TRANSLUCENT AND FLAME RESISTING DOORS.

RUBBARITE LTD.

NEW BIRD STREET,
LIVERPOOL, 1.

Phone:
ROYAL 9771
Grams:
RUBBARITE, LIVERPOOL

Rubber Proofing

OF ALL FABRICS FOR THE WATERPROOF GARMENT INDUSTRY

" AQUACHECK "
CUT TAPES & NON CONS
(biased and straight)

Interlinings for the Rainproof Trade.
Proofed Piece Goods.
Specialists in Proofing for Bags.

Proofing for Ground Sheets, Motor Hoods, Covers for Lorries and Stores, etc.

ALFRED O. FERGUSON & CO. LTD.

WINDSOR MILL, HOLLINWOOD, OLDHAM

Telephone: Failsworth 2206
Telegrams: Nonporous Hollinwood Oldham

London: Bush House, Bush Lane, E.C.4
Telephone: Mansion House 0781

L1

HARRISON & JONES (FLEXIBLE FOAM) **LTD**
LARGEST MANUFACTURERS OF POLYESTER FLEXIBLE FOAM IN GREAT BRITAIN ···

Producers of

PURATHANE

Polyester and Polyether—
the most effective insulating and cushioning materials of today

AVAILABLE IN SIZES TO CUSTOMERS' OWN SPECIFICATION, IN BLOCK DENSITIES OF 1¼lbs. to 4½lbs. PER CU. FOOT

Made at:

SWAN MILL, MIDDLETON JUNCTION, MANCHESTER
Phone: MID. 2468 9 Grams: SWANMILL, Manchester

Associated with Harrison & Jones Ltd., Purax Mills,
292 Vauxhall Road, Liverpool 3
Producers of "PURAX" Rubberised Hair and Fibre Paddings

CW 8430

We specialise in

PVC SCRAP

Home and Export

Enquiries Welcomed

DERRICK DAVIS PLASTICS LIMITED

ORKNEY WORKS, ORKNEY STREET, LONDON, S.W.1

Tel. MACAULAY 8666 and 8822 Cables DERDAVIS, LONDON

R. W. GREEFF & CO. LTD.

Sole distributors in the U.K.

for Vanderbilt Rubber Chemicals

British-produced Accelerators:

VANCURE DAA* *(Delayed Action Accelerator)*
ALTAX* CAPTAX*
METHYL & ETHYL TUADS*
METHYL & ETHYL ZIMATE
UNADS* AMAX

* *can be supplied in pellets as well as in powder*

Vulcanising Agents

VANDEX (Selenium)
TELLOY (Tellurium)

Pine Tar: TARENE

Carbon Black: P33 & Thermax

Oakes Continuous Automatic Mixer and Blender for the production of foam rubber

R. W. GREEFF & CO. LTD.

Garrard House, 31-45 Gresham Street, London, E.C.2
Telephone: Monarch 1066
at the ROYAL EXCHANGE, MANCHESTER 2
Telephone: Blackfriars 9407
also at 7 Swan Buildings, 113 Edmund Street, Birmingham

LACENTEX

MALAYAN ESTATE CENTRIFUGED NATURAL RUBBER LATEX

Substantial stocks of "LACENTEX" are maintained in Malaya and the United Kingdom ensuring immediate delivery
"LACENTEX" is available in bulk or packed in 45 gallon drums
LOW AMMONIA FORM can be supplied

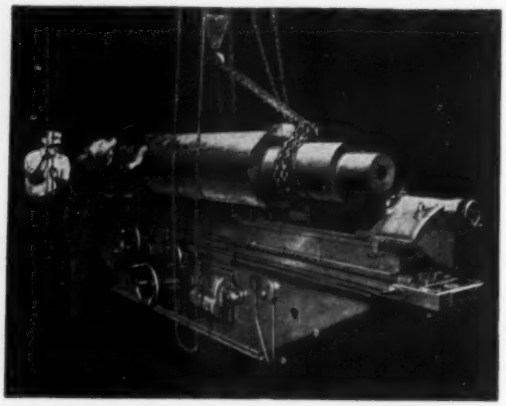
Apply to the sole Selling Agent.

MACLAINE, WATSON & Co. Ltd.

14, FENCHURCH STREET, LONDON, E.C.3

TELEGRAMS: Iavanistic, London *TELEPHONE: MANsion House 6284* *TELEX GB. LN. 28366*

MILLS CONVERTED TO NEW SAFETY STANDARDS



INSTALLATION MAINTENANCE

REPAIRS NEW MACHINES

SPARE PARTS FOR ALL TYPES OF INDUSTRIAL PLANT

UNITS HANDLED UP TO FOUR TONS

•

ROLL GRINDING A SPECIALITY

JAMES H. PULLEN (1942) LTD.

ROTHERMERE ROAD WADDON SURREY *Telephone: Croydon 6067/8*

If your ambition in the rubber industry is to manufacture rubber which is equally well endowed with the best physical properties—then you need Micafine Mica Powders. Their application to production and formulation problems in the rubber industry has been tremendously successful and their scope is constantly increasing. Micafine Mica Powders could play a vital part in solving *your* problems.

As a lubricant Mica powder is ideal. With its chemical inertness and unique physical form it is equally effective applied either dry or wet in the form of a slurry.

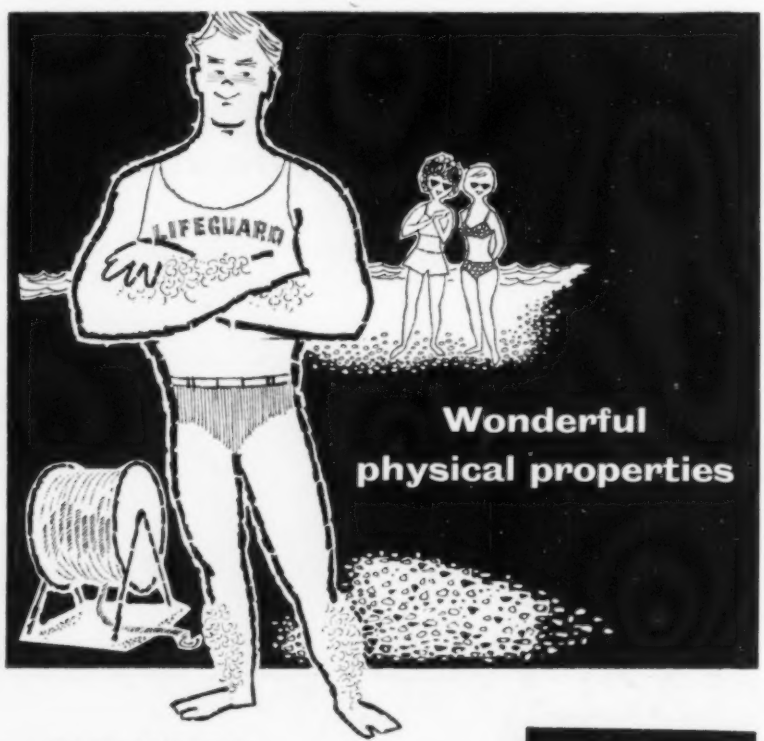
In sponge rubber Mica powder has unique qualities as a filler. Chemically inert, it actually increases the load bearing properties, without impairing the efficiency of the blowing process.

In latex foam Mica powder shows considerable advantages over other fillers, resulting in low density foams with good resilience and compression qualities.

In latex compounds Mica powder produces a marked hardening in the dried film, making it particularly suitable for hard casting compounds, adhesive and latex flooring compounds.

In polyurethane foams Mica powders increase the compression hardness of polyether and polyester foams. This property offers possibilities in the production of profiled cushions thereby reducing costs.

To enable you to test the efficiency of Micafine Mica powders in your own laboratories, test samples will be sent free and without obligation on request. Please write to:



micafine **MICA POWDER**

MICAFINE LIMITED • RAYNESWAY • DERBY TELEPHONE: DERBY 55981 (3 lines)

micafine limited

TREATED LINERS

made from Super High Tenacity Rayon

SYNTHETIC

WRAPPING and CURING TAPES

Important Reductions in Costs over Conventional Materials

MADE TO SPECIFICATION

FROM THE TOUGHEST YARNS FOR REAL PERFORMANCE
PROVED OVER MANY YEARS IN LEADING MILLS

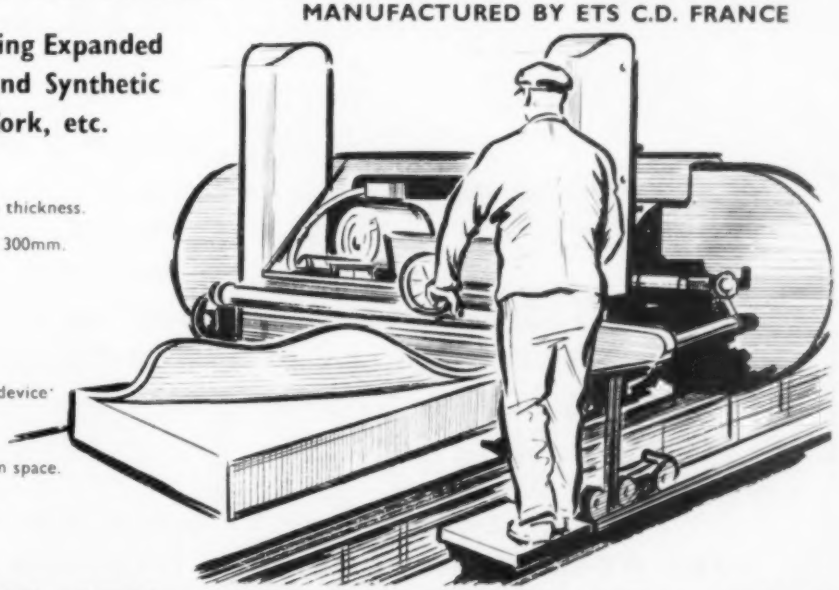
HK Import & Export LTD. 21 ASHLEY PLACE, LONDON, S.W.1

Tel: VICtoria 2422/3 Telex: London 28618 — HK London Cables: "Kaygolet, London"

R.L.M.P. high production
Horizontal band saws

MANUFACTURED BY ETS C.D. FRANCE

Specially designed for cutting Expanded Plastic materials, Latex and Synthetic Rubber, Conglomerated Cork, etc.



- Handles blocks of up to one metre thickness.
- Cuts thicknesses from 1mm. up to 300mm.
- Cuts to close tolerances.
- Cuts to any length.
- Cuts contours to any profile.
- Incorporates automatic sharpening device.
- Simple, strong, efficient.
- Economical and occupying minimum space.

Sole United Kingdom Distributor:

DENIS LEADER LTD., 47 VICTORIA ST., S.W.1

Telephone: Abbey 7538/9 Cables: Polyamide, London

NORIT

granular activated carbon grades are being used all over the world as catalyst carriers in the manufacturing process of vinylchloride and vinylacetate.

For full information please apply to:

United Norit Sales Corporation Ltd., Amsterdam - Holland.

Canadian Branch Office: P. O. Box 310, Scarborough (Ontario)

BORO RUBBER COMPANY
(1912) LIMITED

★

Manufacturers of

MOULDED RUBBER SOLES, HEELS AND SOLING SHEET
RUBBERISED FELT SHEETING
MOULDED SPONGE RUBBER SOLES
RUBBERISED CORK SHEETING
RESIN-RUBBER SHEETING AND MICRO-CELLULAR SOLING
SPONGE AND SOLID COMPOUNDS FOR MOULDED FOOTWEAR

★

Enquiries to Factory and Registered Office:

PARA WORKS, SMITHY BRIDGE, LITTLEBOROUGH, LANCS.

Telephone: LITTLEBOROUGH 88624-5

Rubber and Plastics Scrap

IMPORT EXPORT

BELGRAVE INDUSTRIES
CHESHIRE WORKS · CHEAPSIDE · HYDE · CHESHIRE
Telephone: Hyde 2500 – 2135

To brighten and bring out all the best in rubber be sure to specify

MACKECHNIE BRAND

LITHOPONE

M K B

McKECHNIE BROTHERS LTD.,
Lithopone Works, P.O. Box 4, Widnes, Lancs. *Telephone:* Widnes 2611

Branch Sales Office: 14 Berkeley Street, London, W.1 *Telephone:* HYde Park 5011[illegible]

PHOENIX PROOF REGD.
Waterproof Cloth
PLIOCENE REGD.
Leather Cloth
ENVERDAIM REGD.
Suedette Fabrics

Ferguson Shiers Limited

FAILSWORTH, NEAR MANCHESTER

LEYLAND

RUBBER PRODUCTS

QUALITY AND DURABILITY

Driving and Conveyor Belts, Rubber Hose, Mechanicals, Technical Articles, Surgicals, Hot Water Bottles, Erasers, Sports Goods, Rubber Floors
and all Rubber Requirements

THE LEYLAND & BIRMINGHAM RUBBER CO. LTD.
LEYLAND, PRESTON

Telegrams: "Rubber, Leyland" Telephone: Leyland 21434

Factories: Leyland, Glasgow, Mitcham, Dublin

Branches: London, Birmingham, Cardiff, Glasgow, Dublin

USED THE TRADE MARK WORLD OVER

IMPORTERS • EXPORTERS

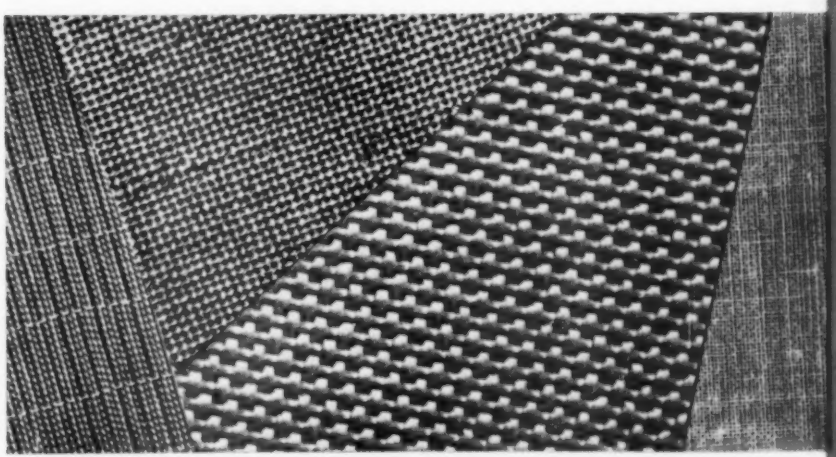
APEX RUBBER COMPANY LIMITED

CUBITT TOWN WHARF
SAUNDERS NESS ROAD, E.14
Telephone: EAST 4911

CABLE ADDRESS: FOREIGN—BOROVMET, LONDON
INLAND—BOROVMET, LONDON, E.14

Buyers and Sellers of WASTE RUBBER AND PLASTICS of all descriptions

TEXTILES *FOR THE* RUBBER *AND* PLASTICS INDUSTRIES.....



Reinforcing Fabrics for

HOSE
TYRES
BELTING
SHEETING
FOOTWEAR
PACKINGS
VEE ROPES

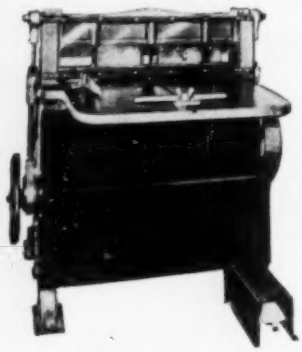
RAYON
NYLON
COTTON
TERYLENE

PRESTON TYRE FABRIC MFG. CO. LTD.
HIGHER WALTON, PRESTON Telephone: PRESTON 85251 (4 lines)

CUTTING MACHINERY

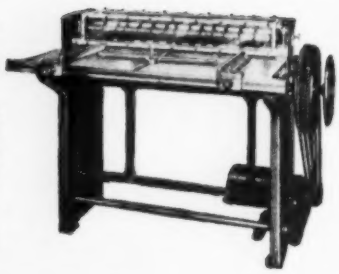
AND EDGE TOOLS

for Rubber and Plastics



Model No. 27
POWER GUILLOTINE
Rapid cutting of sheets and strips, also Extruded Material to size. Sizes 20" and 30"

Model No. 125 R.
ROTARY CUTTING MACHINE
Strip cutting sheets, Cross cutting for Squares, Oblongs, TILES, Adjustable for size. Power operation. Sizes 25½", 32", 38", 52", 60" and 72" widths.



Ribbon Steel Cutters for Shapes, Washers, Gaskets, Glove Pieces, etc.

Model No. 1
HAND SHEAR CUTTING MACHINE
Stand Model,
Sizes 30", 43", 54" and 60" length of cut.
Other Models up to 114" length of cut.

T. KENDELL & SONS LTD.

Established 1840

French Place, Shoreditch, London, E.1, England

Telephone: SHOreditch 4782/3/4

WE SHALL BE PLEASED TO QUOTE ON RECEIPT OF ENQUIRIES

NEWCON

Makers of MECHANICAL HANDLING PLANT for the RUBBER INDUSTRY

including:-

OVERHEAD CHAIN CONVEYORS
for Green Tyres, Tyre Bands,
Cured Tyres, and Finished Tyres
GREEN TYRE FLAT BAND CONVEYORS
COMPLETE TUBER TREAD UNITS
INTER-MILL CONVEYORS
MILL-TO-CALENDER CONVEYORS
FESTOON UNITS
STRIP FEED CONVEYORS
AND CARBON-BLACK PLANT

The following
are some users of
NEWCON EQUIPMENT

DUNLOP RUBBER CO. LTD.
GOODYEAR TYRE & RUBBER CO. LTD.
NORTH BRITISH RUBBER CO. LTD.
PIRELLI LTD.
MICHELIN TYRE CO. LTD.
EMPIRE RUBBER CO. LTD.
FRANCIS SHAW & CO. LTD.
DAVID BRIDGE & CO. LTD.
PHILBLACK LTD.
CABOT CARBON LTD.
INDIA TYRE & RUBBER CO. LTD.
DUNLOP ADVISORY SERVICES LTD.

NEW CONVEYOR CO. LTD

Head Office: SMETHWICK, BIRMINGHAM 40
BRANCHES IN LONDON AND MANCHESTER

A COMPANY

MacLellan Rubber

For industry or holiday MacLellan make Sea-Esta Airbeds, and sell them all over the world.

FOR INDUSTRY

HOSE Standard grades and bores exceptional quality and strength. For suction, delivery, heavy duty and chemical service. Specials up to 30 in. bore. Handling base of sinuous flexibility.

MECHANICALS

Rubber sheet and insertion expansion joints and flexible bellows; conveyor belting joints, washers, brushes, etc.

Rubber Solution for Sticky Problems

The MacLellan Special Products Division is adept at solving industrial problems with Rubber. Have you a problem? We could provide the answer.

MacLellan also make Protective Clothing, Asbestos Millboard, Rubber Buckets, etc., and provide Macbond Lining and Covering Service.

George MacLellan & Co. Ltd.

Maryhill, Glasgow, N.W. Burston Road, Putney, London, S.W.15

Telephone: PENdleton 4504 and 4505

Telegrams:
TRAVRUB, PHONE, MANCHESTER

TRAVIS INDUSTRIES LTD

IMPORTERS AND EXPORTERS

ALL GRADES

SCRAP RUBBER • SCRAP EBONITE • RUBBER CRUMB

SCORCHED COMPOUNDS • SCRAP PLASTICS • GUTTA PERCHA

OVER
50 YEARS EXPERIENCE
EXPERT SUPERVISION

ENQUIRIES SOLICITED

HEAD OFFICE:

Travis Works, Fitzwarren St., Pendleton, 6, Manchester, England

A. & N. RUBBER CO., LTD.

Manufacturers of Moulded Rubber Products,
Cork/Rubber Compositions, and Compounding Specialists
in Natural and Synthetic Rubbers

HIGH STREET, FRODSHAM, CHESHIRE *Telephone: FRODSHAM 3136*

"LEEDS & BRADFORD"

VULCANISING PANS

fitted with their Patent

"Quicklock" (REGISTERED TRADE MARK) **DOOR**

protected by their Patent

"Surelock & Mustlock" Safety Devices

and their new

"Checklock" "Wontlock" & "Dontlock"

Safety Devices (PATENTS PENDING)

STAND SUPREME

● If you are troubled by corrosion, you will be interested in our wonderfully effective Patent "Permalock" Process for combating this at the most vulnerable place—in the vicinity of the joint.

● For anything to do with Vulcanisers, Heaters or Cures consult the people who are *really* interested (and have been for a long time).

THE LEEDS & BRADFORD BOILER Co. Ltd., Stanningley, Pudsey, Yorks.

Telephone: PUDSEY 3134 *The Vulcaniser People*

PLANTATION RUBBER
RUBBER LATEX

All Grades

For samples and prices please write to:

HILTON, WALLACE & CO. LTD.
St. Dunstan's House
Idol Lane, London, E.C.3
Telephone: Mansion House 1005

chemicals for rubber and plastics

ACCELERATORS
FACTICE (ALL GRADES)
FILLERS (REINFORCING & INERT)
RECLAIMED RUBBERS
SOFTENERS
VULCANISING AGENTS

J. ALLCOCK & SONS LTD

WEST GORTON, MANCHESTER, 12

Telephone: EAST 0173 Telegrams: Rubbasub, Manchester

For

A.I.D. APPROVED

MIXING
MOULDING
DICING

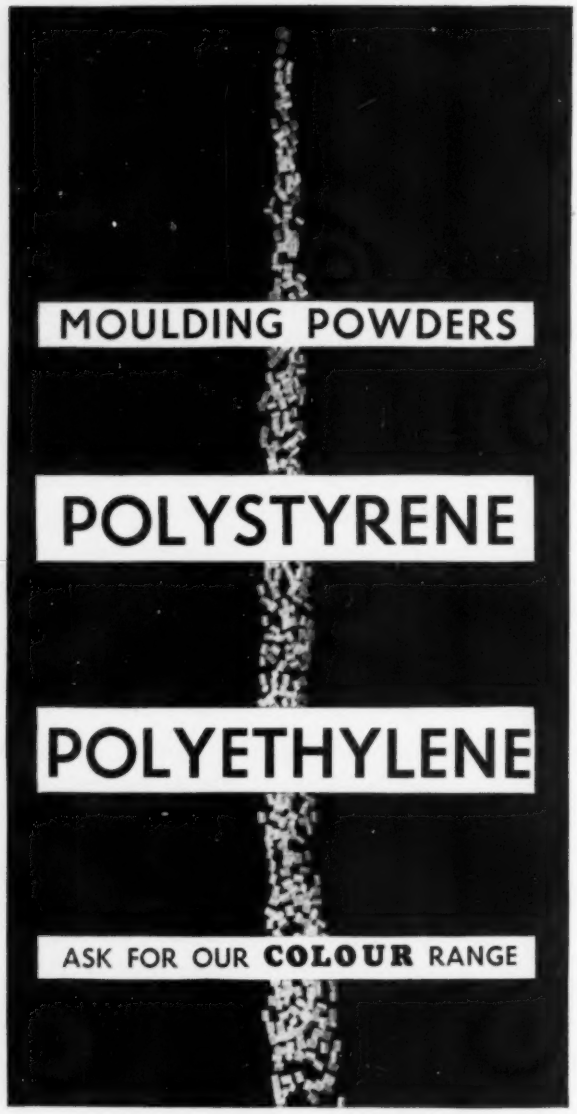
Rubber or Plastics

Enquire:

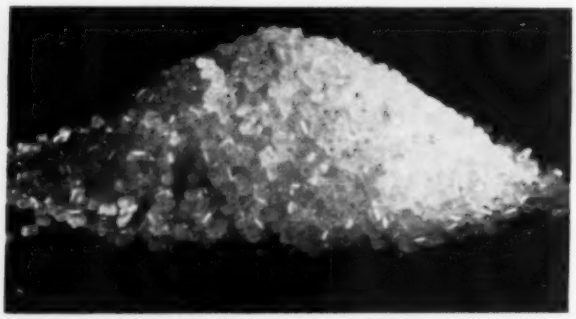
HATCHAM RUBBER CO. LTD.

PRINCES WAY, WADDON, CROYDON, SURREY

PROMPT SERVICE • ***Telephone: CROydon 6054/6***



John Hellyar & Co. Ltd.
230 Vauxhall Bridge Road, London, S.W.1
Telephone: VICtoria 7085 *Telegrams:*
Cables: Hellplast London, S.W.1. *Hellplast Lowest London*
Works: 221 Rotherhithe New Road, London, S.E.16



VC **MOULDS** VC

COMPRESSION
INJECTION
MOULDS

EBONITE RUBBER

JIGS FIXTURES

PLASTICS F/GLASS

SPECIAL
PURPOSE
MACHINERY

VERSON ENGINEERING CO. LTD.
MIDDLETON JUNCTION, MANCHESTER
MIDDLETON 2328 & 3348

Kautschuk und Gummi

Official Journal of the German Society of Rubber Chemists and Technologists
(Deutsche Kautschuk-Gesellschaft e.V.)

the most quoted and authoritative
GERMAN RUBBER JOURNAL

KAUTSCHUK und GUMMI promotes international exchange of ideas concerning economic, technical and scientific problems involved in the different phases of the manufacture of rubber and asbestos products. Business experts and authorities in science and technology supply facts, opinions, and research results. Reports and information from the industries' various associations are included.

KAUTSCHUK und GUMMI is an excellent advertising medium which addresses itself to just those firms in the import and export trade whom you want to interest. Specimen copy and advertising rates on application to the publishers.

Kautschuk und Gummi

BERLIN-BORSIGWALDE, FRANKFURT am MAIN

"Cressite"

MOULDED AND
EXTRUDED
COMPONENTS
to any specification in
RUBBER
NATURAL AND
SYNTHETIC

CRESSALL

TYRE & RUBBER Co. LTD
Cressite Works,
Oyster Lane,
Byfleet, Surrey
TELEPHONE: BYFLEET 43217-8
CABLES: CRESSITE, BYFLEET

S

sulphur

Supplies available in almost every form including:
INSOLUBLE 85 and 95%
FLOWERS (Sublimed)
PRECIPITATED B P

"BUNATAK"

PLASTICISERS
& POLYMERS

HUGHES & HUGHES LTD
DEPT. R., 35 CRUTCHED FRIARS, LONDON, E.C.3
Telephone: Royal 3976

E G L

Edwin Gornall Ltd
SOVEREIGN WORKS, CARDIGAN ST.,
RADCLIFFE, MANCHESTER

*

The largest organization
in England for Debeading
and Dissecting tyres
of all types to customers
requirements

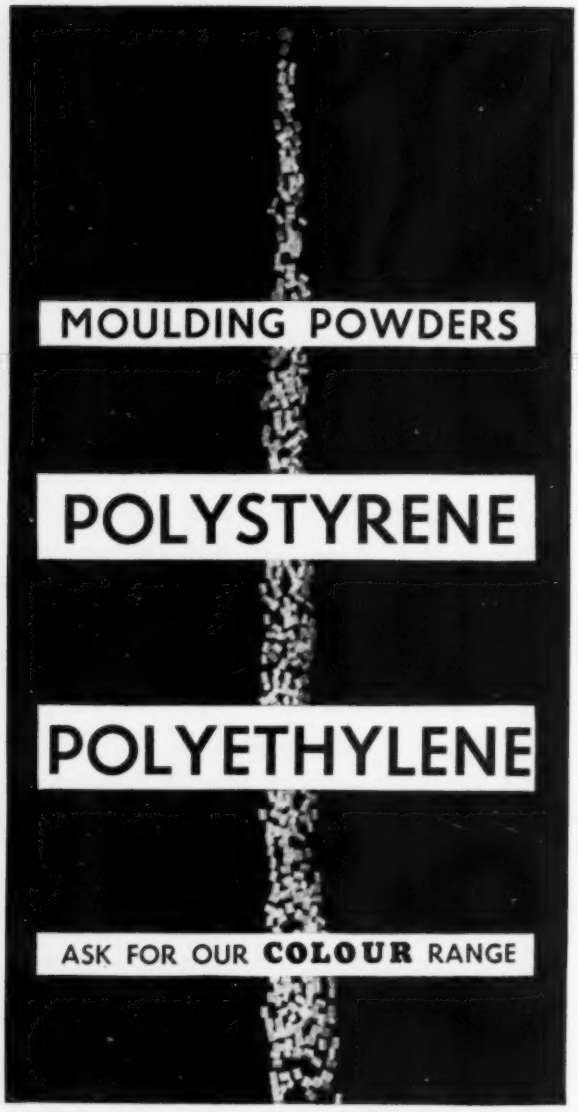
*

and at

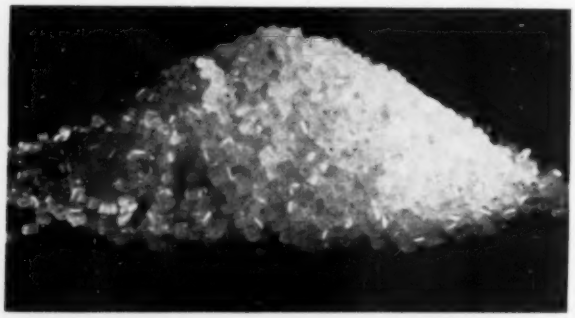
BRITANNIA WORKS, BOLTON ROAD,
RADCLIFFE, MANCHESTER

Buyers and sellers of all types
WASTE RUBBER
PLASTIC SCRAP
INNER TUBES a speciality

TRY US FOR PRICES: Ring
Radcliffe 3051-3052-3162



John Hellyar & Co. Ltd.
230 Vauxhall Bridge Road, London, S.W.1
Telephone: VICtoria 7085 *Telegrams:*
Cables: Hellplast London, S.W.1. *Hellplast Lowest London*
Works: 221 Rotherhithe New Road, London, S.E.16



EVc **MOULDS** EVc

COMPRESSION
INJECTION
MOULDS

EBONITE RUBBER

JIGS EVc FIXTURES

PLASTICS F/GLASS

SPECIAL
PURPOSE
MACHINERY

VERSON ENGINEERING CO. LTD.
MIDDLETON JUNCTION, MANCHESTER
MIDDLETON 2328 & 3348

Kautschuk und Gummi

Official Journal of the German Society of Rubber Chemists and Technologists
(Deutsche Kautschuk-Gesellschaft e.V.)

the most quoted and authoritative
GERMAN RUBBER JOURNAL

KAUTSCHUK und GUMMI promotes international exchange of ideas concerning economic, technical and scientific problems involved in the different phases of the manufacture of rubber and asbestos products. Business experts and authorities in science and technology supply facts, opinions, and research results. Reports and information from the industries' various associations are included.

KAUTSCHUK und GUMMI is an excellent advertising medium which addresses itself to just those firms in the import and export trade whom you want to interest. Specimen copy and advertising rates on application to the publishers.

Kautschuk und Gummi

BERLIN-BORSIGWALDE, FRANKFURT am MAIN

"Cressite"

MOULDED AND EXTRUDED COMPONENTS

to any specification in

RUBBER NATURAL AND SYNTHETIC

CRESSALL

TYRE & RUBBER Co. LTD
Cressite Works,
Oyster Lane,
Byfleet, Surrey
TELEPHONE: BYFLEET 43217-8
CABLES: CRESSITE, BYFLEET

S

sulphur

Supplies available in almost every form including:
INSOLUBLE 85 and 95%
FLOWERS (Sublimed)
PRECIPITATED B P

"BUNATAK"

PLASTICISERS & POLYMERS

HUGHES & HUGHES LTD

DEPT. R., 35 CRUTCHED FRIARS, LONDON, E.C.3
Telephone: Royal 3976

E G L

Edwin Gornall Ltd

SOVEREIGN WORKS, CARDIGAN ST.,
RADCLIFFE, MANCHESTER

*

The largest organization in England for Debeading and Dissecting tyres of all types to customers requirements

*

and at

BRITANNIA WORKS, BOLTON ROAD,
RADCLIFFE, MANCHESTER

Buyers and sellers of all types
WASTE RUBBER
PLASTIC SCRAP
INNER TUBES a speciality

TRY US FOR PRICES: Ring
Radcliffe 3051-3052-3162

THE UNITED STEEL WIRE MILLS LIMITED

(ESTABLISHED 1908)

MANUFACTURERS OF STEEL WIRE, BEAD FOUNDATIONS FOR CYCLE, MOTOR-CYCLE, MOTOR AND AERO TYRES GLIDER CLIPS FOR THE STATIONERY TRADE

Registered Office and Factory:

SOUTH STREET, OPENSHAW, MANCHESTER, 11

Telephone: EAST 1401 (2 lines) *Telegrams: "UNITED" Manchester*

Low Loading Transport
and Mobile Cranes for Hire

Maintenance and Repairs

FACTORY REMOVAL
AND INSTALLATION

New Mills, Special Machines, all types Spare Parts

Telephone: ADDiscombe 1282

W. F. WEBB (ENGINEERS) LTD

Engineers to the Rubber and Plastics Industry

7 MANOR RD., SOUTH NORWOOD, LONDON, S.E.25

ALSO AT: STAINES 55271
AND SWANDEAN 535

Tel. No.: 22212 (4 lines)
Telegrams: "Terbax, Leyland"

Contractors to the Admiralty, War Office, Air Ministry, Stationery Office, Ministry of Supply, Crown Agents for Oversea Governments and Administrations, etc.

★

MANUFACTURERS OF
GENERAL RUBBER GOODS

★

J. E. BAXTER & Co. Ltd

LEYLAND, near Preston

★

SPECIALISTS IN THE MANUFACTURE OF
ERASERS,
INDUSTRIAL MASKS AND RESPIRATORS

GEO. HANKIN & CO.

VICTORIA HOUSE, 118 FENCHURCH STREET, LONDON, E.C.3

Telephone: Mincing Lane 2737/9 *Telegrams: Outerly, Telex*

CRUDE RUBBER

LIQUID LATEX

SOLE CREPE

Index to Advertisers

A

	PAGE
Abrasive Developments Ltd., Henley-in-Arden, Solihull, Warwicks.	xliv
Akron Standard (Engineers) Ltd., Newstead, Trentham, Stoke-on-Trent, Staffs.	xxii
Allcock, J., & Sons Ltd., Oak Street Chemical Works, West Gorton, Manchester 12	705
A. & N. Rubber Co. Ltd., High Street, Frodsham, Cheshire	704
Anchor Chemical Co. Ltd., Clayton, Manchester 11	Cover i, lxv
Anderson, Joseph, & Sons Ltd., Bank Street, Clayton, Manchester 11	xliii, v
Apex Rubber Co. Ltd., Cubitt Town Wharf, Saunders Ness Road, E.14	701
Astlett, H. A., & Co. Inc., 39 Broadway, New York 6, New York U.S.A.	lvi

B

Baker Perkins Ltd., Westwood Works, Peterborough, Northants	xix, xiii
Barwell Engineering Ltd., Swavesey, Cambridge	710
Baxter, J. E., & Co. Ltd., Leyland, Preston, Lancashire	708
Belgrave Industries (Exports) Ltd., Cheshire Works, Cheapside, Hyde, Cheshire	699
Blythe Colour Works Ltd., Cresswell, Stoke-on-Trent, Staffs.	xxxix
Boro Rubber Co. (1912) Ltd., Para Works, Smithy Bridge, Littleborough, Lancashire	698
Bridge, David, & Co. Ltd., Castleton, Rochdale, Lancashire	lxxii, lxxiii, lxxiv, lxxv
Bright, John, & Bros. Ltd., Fieldhouse Mills, Rochdale, Lancashire	xviii
British Geon Ltd., Devonshire House, Piccadilly, London, W.1	xxvi, xxvii
British Recovered Rubber Co. Ltd., The, Ashton New Road, Clayton, Manchester 11	xxx, xxxi
British Titan Products Co. Ltd., 10 Stratton Street, London, W.1	Cover ii

C

Cabot Carbon Ltd., 62 Brompton Road, London, S.W.3	ix
Carter Bros. (Rochdale) Ltd., Mellor Street, Rochdale, Lancashire	lix
Chance & Hunt, 5-7 St. Helen's Place, London, E.C.3	xxiv
Chase, Bernard, St. Katharine's House, 69 Mark Lane	xxxiv
Chemical & Insulation Ltd., Darlington, Co. Durham	lxvi
Cressall Tyre & Rubber Co. Ltd., Byfleet, Surrey	707
C.W. Rubber Export Ltd., The Quarry, Quarry Street, Woolton, Liverpool 25	lxix

D

Daniels, T. H. & J., Ltd., Lightpill Iron Works, Stroud, Glos.	vii
Davis, Derrick, Plastics Ltd., Orkney Works, Orkney Street, S.W.1	694
Distillers Co. Ltd., The	596, 598, 600, 602
Dixon, T. H., & Co. Ltd., Works Road, Letchworth, Hertfordshire	i
Docker, John, & Co. (Engineers) Ltd., Cromwell Works, North Feltham Trading Estate, Feltham, Middlesex	595
Dunlop Rubber Co. Ltd., St. James's House, St. James's Street, London, S.W.1	xxxii
Du Pont Co. (United Kingdom) Ltd., 76 Jermyn Street, London, S.W.1	xxxiii

E

	PAGE
English Clays Lovering Pochin & Co. Ltd., 14 High Cross Street, St. Austell, Cornwall	xx
English Electric Co. Ltd., The, English Electric House, Strand, W.C.2	iv
Esso Petroleum Co. Ltd., 50 Stratton Street, W.1	xxiii
Evode Ltd., Common Road, Stafford	687

F

Fawcett Preston & Co. Ltd., Bromborough, Cheshire	xv
Ferguson, A. O. & Co. Ltd., Windsor Mill, Hollinwood, Oldham	693
Ferguson Shiers Ltd., Phoenix Mills, Failsworth, nr. Manchester	700
Franklin, J. G., & Sons Ltd., Birkbeck Works, Colvestone Crescent, London, E.8	xxxvii

G

Goodyear Tyre & Rubber Co. (G.B.) Ltd., The, Chemical Division, 8-9 Salop Street, Wolverhampton	683
Gornall, Edwin, Ltd., Sovereign Works, Cardigan Street, Radcliffe, Manchester	707
Greeff, R. W., & Co. Ltd., Garrard House, 31-45 Gresham Street, E.C.2	695

H

Halsteads Engineers (Leyland) Ltd., Golden Hill Lane, Leyland, Lancashire	691
Hankin, Geo., & Co. Ltd., 7 London Street, London, E.C.3	708
Hardman & Holden Ltd., Manox House, Miles Platting, Manchester	xxviii
Harrison, W., & Co. Ltd., 12 Broadway, London, S.W.1	x
Harrisons & Crosfield Ltd., 1-4 Great Tower Street, London, E.C.3	xvi
Harrison & Jones Ltd., Swan Mills, Middleton Junction, Manchester	694
Hatcham Rubber Co. Ltd., Princes Way, Waddon, Croydon, Surrey	705
Hay & Robertson Ltd., St. Margaret's Works, Dunfermline	xxviii
Hellyar, John, & Co., 230 Vauxhall Bridge Road, London, S.W.1	706
Hilton, Wallace & Co. Ltd., St. Dunstan's House, Idol Lane, London, E.C.3	704
H.K. Import & Export Ltd., 21 Ashley Place, S.W.1	697
Hubron Rubber Chemicals Ltd., Albion Works, Albion Street, Failsworth, nr. Manchester	Cover iii
Hughes & Hughes Ltd., 35 Crutched Friars, E.C.3	707

I

Iddon Bros. Ltd., Leyland, Lancashire	x, xi
Imperial Chemical Industries Ltd. (Dyestuffs Division), Millbank, London, S.W.1	xxi
Imperial Chemical Industries Ltd. (Plastics—Butakon Division), Imperial Chemical House, Millbank, London, S.W.1	Cover ii
Imperial Chemical Industries Ltd. (Billingham), Millbank, London, S.W.1	xli
International Synthetic Rubber Co. Ltd., The, Southampton	xix
Ioco Ltd., Anniesland, Glasgow, W.3	688

K

Kendell, T., & Sons Ltd., Norfolk Ironworks, French Place, Shoreditch, London, E.1	702
Ketjen Carbon, 63 Mauritskade, Amsterdam, Holland	xlvii
Kautschuk und Gummi, Berlin-Borsigwalde, Frankfurt am Main	706

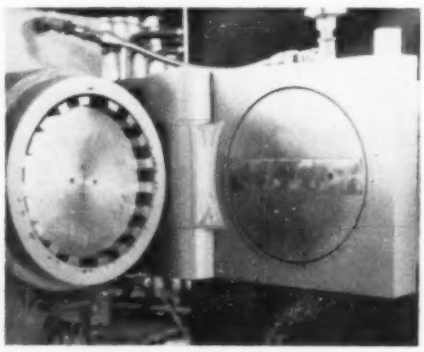
	PAGE
L	
LAPORTE, TITANIUM LTD., New Bond Street House, London, W.1	liii
LATEX ENGINEERING CO., Victoria Street, Droylsden, Manchester	lxx
LEADER, DENIS, LTD., 47 Victoria Street, S.W.1	697
LEEDS & BRADFORD BOILER CO. LTD., THE, Stanningley, nr. Leeds	704
LEYLAND & BIRMINGHAM RUBBER CO. LTD., THE, Leyland, Preston, Lancashire	700
LORD, R., & SONS LTD., Barnbrook Boiler Works, Bury, Lancashire	690
M	
MCKECHNIE BROS. LTD., Lithopone Works, Widnes, Lancashire	699
MACLAINE, WATSON & CO. LTD., 14 Fenchurch Street, London, E.C.3	695
MACLELLAN, GEORGE, & CO. LTD., Maryhill, Glasgow, N.W.	703
MERKLE, P. W., LTD., 60 Tabernacle Street, London, E.C.2	692
MICAFINE LTD., Raynesway, Derby	696
N	
NEDERLANDSCH VERKOOPKANTOOR VOOR CHEMISCHE PRODUCTEN, N.V. 63 Mauritskade, Amsterdam, Holland	xlvii
NEW CONVEYOR CO. LTD., Smethwick, Birmingham 40	702
NORTHWESTERN RUBBER CO. LTD., Litherland, Liverpool	ii
NOVADEL LTD., St. Ann's Crescent, Wandsworth, S.W.18	lxviii
O	
OAKES, E. T., LTD., Queens Avenue, Macclesfield, Cheshire	lxi
OSWALD & DUNCAN LTD., Mayfield Mill, Rochdale, Lancashire	xiv
P	
PECO MACHINERY, 28 Victoria Street, S.W.1	lxiii
PHILBLACK LTD., Westbury-on-Trym, Bristol	604
PHOENIX RUBBER CO. LTD., 2k Buckingham Avenue, Trading Estate, Slough, Bucks	lxiv
PRECISION RUBBER PRODUCTS (DENTON) LTD., Heaton Works, Denton, Manchester, Lancashire	691
PRESTON TYRE FABRIC MANUFACTURING CO. LTD., Higher Walton Mills, Preston	701
PRICES (BROMBOROUGH) LTD., Bromborough Pool, New Ferry, nr. Birkenhead	xlii
PULLEN, JAMES H. (1942), LTD., Rothermere Road, Waddon, Surrey	696
R	
RICHARDSON, SID, CARBON CO., Fort Worth, Texas, U.S.A.	lvii
ROBINSON BROS. LTD., Ryders Green, West Bromwich, Staffs.	lxxvi
ROBINSON, JOSEPH, & CO. LTD., Springfield Lane, Salford 3, Lancashire	xxv
ROTUNDA LTD., Holland Street, Denton, Manchester	vi
RUBBARITE LTD., New Bird Street, Liverpool 1	693
RUBBER CO. OF SCOTLAND LTD., THE, Forthvale Works, Stirling, Scotland	lx
RUBBER ESTATE AGENCY LTD., THE, 53 Eastcheap, London, E.C.3	lxvii
RUBBER LATEX LTD., Harling Road, Wythenshawe, Manchester	692
RUBBER REGENERATING CO. LTD., THE, Trafford Park, Manchester 17	Cover iv
S	
SHAW, FRANCIS, & CO. LTD., Corbett Street Works, Ashton New Road, Manchester 11	xlix, l, li, lii
SHELL INTERNATIONAL CHEMICAL CO. LTD., St. Helen's Court, Great St. Helen's, London, E.C.3	Inset
SMITH, ALFRED, LTD., Stoneferry, Hull, Yorkshire	xvii
SMITH, WILFRID, LTD., 16 Philpot Lane, London, E.C.3	xxxv
SPANGENBERG-WERKE, Hamburg-Eidelstedt	686
STEEL, J. M., & CO. LTD., 36-38 Kingsway, London, W.C.2	liv
STOTT, JAMES, LTD., P.O. Box 33, Rochdale, Lancashire	xlvi
STOREYS OF LANCASTER, White Cross, Lancaster	xxxvi
SUTCLIFFE, SPEAKMAN, & CO. LTD., Leigh, Lancs.	viii
STURGE, JOHN & E. LTD., Wheeleys Road, Birmingham 15	lviii
SYMINGTON, WM., & SON LTD., St. Swithin's House, Walbrook, London, E.C.4	lxii
T	
TELCON PLASTICS LTD., Farnborough Works, Green Street Green, Orpington, Kent	689
TEXAS-U.S. CHEMICAL CO., 9 Rockefeller Plaza, New York 20, New York, U.S.A.	lv
TRAVIS INDUSTRIES LTD., 38 Fitzwarren Street, Pendleton 6, Manchester	703
U	
UNITED NORIT SALES CORPORATION LTD., Amsterdam, Holland	690, 698
UNITED STEEL WIRE MILLS LTD., THE, South Street, Openshaw, Manchester 11	708
UNIVERSAL OIL CO. LTD., THE, Hull, Yorkshire	xlviii
UNIVERSAL OIL PRODUCTS CO., 30 Algonquin Road, Des Plaines, Illinois, U.S.A.	xxix
V	
VERSON ENGINEERING CO. LTD., Middleton Junction, Manchester	706
W	
WALLACE, H. W., & CO. LTD., St. James's Road, Croydon, Surrey	iii
WATTELEZ COLOMBES, Seine, France	lxxi
WEBB, W. F., (ENGINEERS) LTD., 7 Manor Road, South Norwood, S.E.25	708
WHITE SEA & BALTIC CO., THE, P. & I. DANISCHEWSKY LTD., 4 Broad Street Place, London, E.C.2	685
WITCO CHEMICAL CO. LTD., Bush House, Aldwych, London, W.C.2	xlv
Z	
ZAMA LTD., Florin Street, Pendleton, Salford 6, Manchester	688

BARWELL BATCH EXTRUDER FOR RUBBER

- ★ Very rapid die changing
- ★ Lower and controlled temperatures
- ★ No wastage of compound
- ★ Less labour required
- ★ Colour compounds can be used in quick succession
- ★ Extrusions with consistent dimensions through multi-aperture dies

BARWELL ENGINEERING LTD

Swavesey, Cambridge. Tel. Swavesey 383 (3 lines)



FACTICES

A range of white and brown qualities

also

"AMBRO" FACTICE—FOR LIGHT COLOURED HEAT CURED PRODUCTS

and

"FACTOPRENE"—A SPECIAL FACTICE FOR NEOPRENE AND ACRYLONITRILE RUBBERS

HUCEL

An odourless, non-staining blowing agent for Sponge Rubbers

BILTAC · SOFTACK

Processing aids and Tackifiers for Natural and GRS Rubbers

Samples and Technical Data from the SOLE MANUFACTURERS

HUBRON RUBBER CHEMICALS LIMITED

FAILSWORTH · MANCHESTER

Telegrams:
HUBRONRUB
MANCHESTER

Telephone:
FAILSWORTH 2691
(5 lines)

Cable Codes: A.B.C. 4th and 5th editions

ALL OVER THE WORLD
Discriminating Rubber Manufacturers
Choose
THE RUBBER REGENERATING CO. LTD.
AS THEIR MAIN
Suppliers of Reclaimed Rubber
Also suppliers of: DISPERSIONS, RUBBER LABELS, ACCELERATORS, ANTIOXIDANTS, PARACRIL RUBBERS, SYNTHETIC RUBBERS & RESINS
TRAFFORD PARK MANCHESTER, 17
TELEPHONE: Trafford Park 1424 TELEGRAMS: "Regenerate" CODE: Western Union Telegraph, Universal Edition

Printed in Great Britain by F. J. PARSONS, Ltd., London and Hastings, and published by the Proprietors, MACLAREN & SONS, LTD., Maclaren House, 131 Great Suffolk Street, London, S.E.1